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What Modern Equipment Has Done

One of a series of articles giving the actual results achieved by replacing obsolete with up-to-date equipment

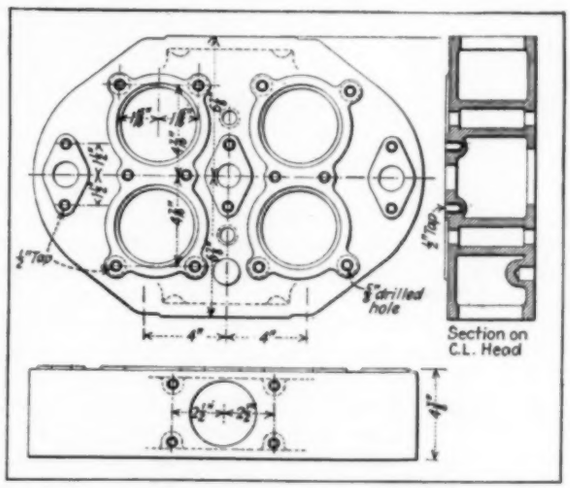
Shop No. 9

Gardner-Denver Company

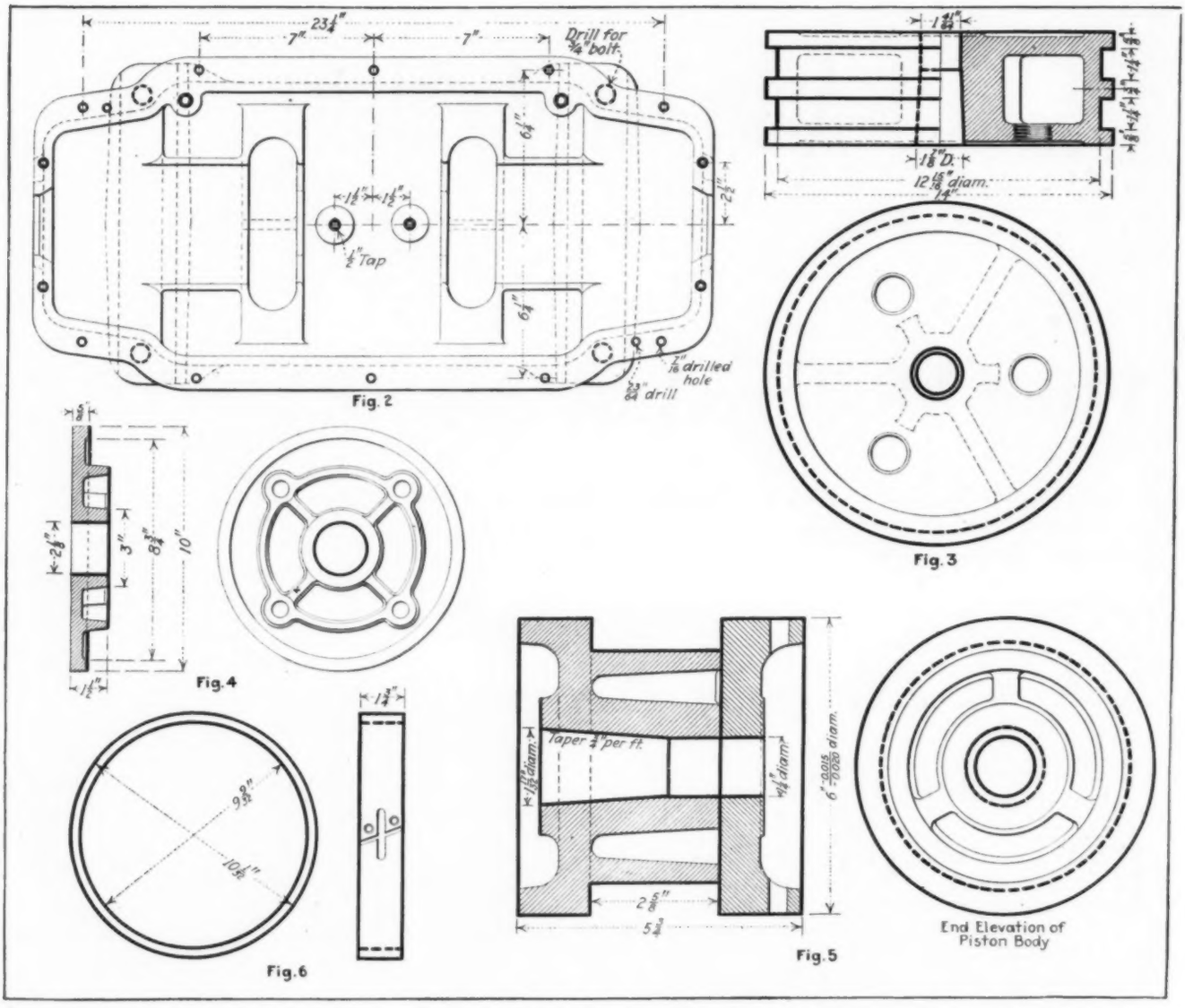
By H. G. Myers
General Superintendent

EQUIPMENT for a shop turning out products in small quantities differs in many ways from high-production machinery used for a single purpose. We find that machines for producing parts in limited lots must be flexible enough to handle several classes of work, and that they must permit changes from one job to another with a minimum amount of alterations. Therefore, when new equipment is considered for such work the problem involves consideration of more than one operation. It usually means a cost revision for a group of operations, the group including all the jobs routed to any particular machine. In addition, we usually have to consider how much available time there will be for the handling of supplementary work. These conditions surround our production policy since our product is made up of large units, such as pumps and compressors, which are produced in quantities according to market requirements. Larger parts for these units are made in lots of from 10 to 50 pieces, and smaller parts are produced in quantities upward to 200 pieces. Even though our quantities are small, modern equipment has aided us in lowering manufacturing costs on many classes of operations, some of which are analyzed by listing the production increases obtained, the average for the eight jobs shown being 88 per cent. We carefully check costs of comparable runs and investigate any unbalanced variations that may be discovered. By this method we can keep a record on how our equipment is operating and whether or not our costs are excessive. This information naturally aids in determining what new equipment is advisable, when consideration is given to what we can expect from a modern machine.

In selecting multiple-spindle drills for some of our work, most of the foregoing principles were regarded carefully. In spite of having these machines idle part of the time, they have effected savings that more than compensate for the lost-time periods. They have sufficient flexibility to handle several different parts, and set-ups can be changed in a comparatively short time. An example of a job transferred from a single-spindle drill to a multiple-spindle machine is the cylinder head illustrated in Fig. 1. The drilling operation performed in the multiple-spindle machine includes 26 holes. Drilling is done from four sides in an indexing-type drill jig as follows: eighteen ½-in. holes on the top face, four ½-in. holes on each of the two opposite sides, and four ⅝-in. holes through the bottom face. The operation is completed in an average time of 40 min., whereas by the former method the operation required 70 min. An increase of 75 per cent in



1 Part—cylinder head. Operation—drill 26 holes, in four directions. Old production—70 min. per piece. New production—40 min. per piece. Increased production 75 per cent



2 Part—crankcase. Operation—drill 20 holes, in two directions. Old production—70 min. per piece. New production—30 min. per piece.

3 Part—steam piston. Operation—turn and face. Old production—3 hours per piece. New production—2 hours per piece

4 Part—piston follower. Operation—bore and face. Old production—12 min. per piece. New production—7 min. per piece. Increased production—71 per cent

5 Part—water piston and follower. Operation—turn and face. Old production—90 min. per piece. New production—28 min. per piece. Increased production—221 per cent

6 Part—piston ring. Operation—turn and cut off. Old production—30 min. per piece. New production—12 min. per piece. Increased production—150 per cent by performing operation in turret lathe

production is the result of the change. Another part that is now drilled in a multiple-spindle machine instead of in a single-spindle drill is the crankcase illustrated in Fig. 2. The drilling operation includes 20 holes, which are drilled from two opposite sides. Four $\frac{1}{2}$-in. holes, two $\frac{33}{64}$-in. dowel holes, and ten $\frac{7}{16}$-in. flange holes are drilled from the top face; and four $\frac{3}{4}$-in. holes from the bottom face. The operation is handled in a trunnion jig. The former method required 70 min. for completion, and the revised set-up requires only 30 min. The production increase is 133 per cent.

Since a considerable portion of our work consists of finishing cylindrical parts, engine lathes and turret lathes are prominent throughout the shop. An increase of 50 per cent in production has been attained by finishing the steam piston, illustrated in Fig. 3, in a modern turret lathe. As heretofore handled the part required three hours for completion, which included two set-ups. By the revised method of handling, the same work now is completed in two hours.

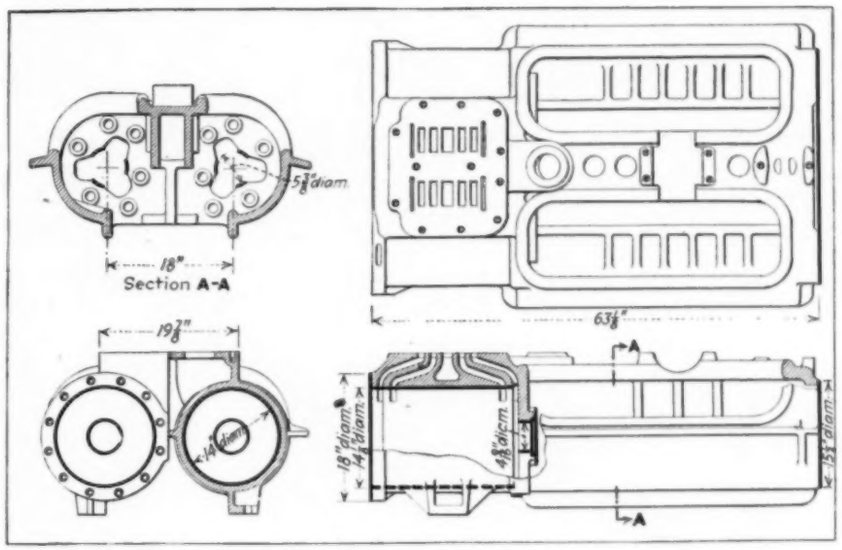
A somewhat shorter job is the facing and boring of the piston follower shown in Fig. 4, which is completed in a turret lathe in 7 min. As formerly handled the operation required 12 min. On this basis the increase in production is 71 per cent.

The water piston and follower, illustrated in Fig. 5, is finished completely in a turret lathe in two operations. The average time per piece is 28 min. Prior to the use of a turret lathe for finishing, the operation required 90 min. for completion. The production increase in this case is 221 per cent.

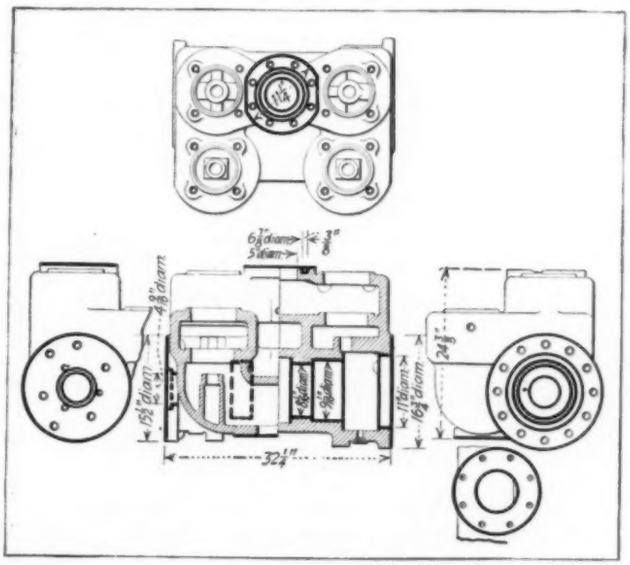
Piston rings, as shown in Fig. 6, are machined from a casting that yields four rings. As previously handled the average time for each ring was 30 min., but by changing the operation to a turret lathe the time has been reduced to 12 min. per ring. The change has resulted

in a production increase of 150 per cent over the old. An increase of 45 per cent in production has been gained by machining the steam cylinder illustrated in Fig. 7 in a modern boring mill instead of in an older machine that was previously used. The present equipment has an indexing table that permits both ends of the work to be handled at one setting. The operation includes the boring of the cylinders and the finishing of the faces indicated. The former time was seven hours, and the present time is 4½ hours.

By reducing the machining time of the water cylinder, shown in Fig. 8, from 4½ hours to 2¾ hours, a production increase equivalent to 63 per cent has been attained. The operation is now handled in a combination boring and milling machine equipped with an indexing-type table. Machining is done from four sides, which includes



7 Part—steam cylinder. Operation—bore and face. Old production—7 hours per piece. New production—4½ hours per piece. Increased production—55 per cent



8 Part—water cylinder. Operation—bore and face. Old production—4½ hours per piece. New production—2¾ hours per piece. Increased production—63 per cent

the boring of a large hole through the center of the casting. As formerly handled, the finishing of the same surfaces required two operations, the total time per piece shown being figured on this basis.

The Employer and the Workers' Health—*Discussion*

By R. D. Gunnis

COMMENTING on the article under the above title, on page 920, Vol. 69, of the *American Machinist*, I believe that the importance of the health service in the modern plant is not stressed enough. The functions of the plant doctor have come to include more than a physical examination of applicants. Many organizations in which there are no physical examinations for employment have a plant doctor, either on a full-time or part-time basis. The proportion of time that he is at the plant usually depends somewhat on its size. He maintains a dispensary, not only for accident, but for health.

If the plant be fairly large, and the doctor be on a part-time basis, the dispensary is usually in charge of a nurse, who, when occasion demands, will also go to the homes of workers who are ill and who desire aid. This home visiting sometimes takes the form of a systematic follow-up of all workers who do not report for duty on any day. When thus organized, it has the added advantage of decreasing absenteeism.

The greatest function of the medical department, if organized to give health service, is to keep the worker well and on the job. If the confidence of the workers can be secured so that they will report to the dispensary when they first feel ill, it will usually eliminate a large proportion of absenteeism.

If a medical department to give health service is installed, it is best that it be under the control of a highly competent physician, even though he give only part of his time to the work. A medical department can do much to reduce compensation claims and loss of production time.

Chinese Railway Museum Appeals for Equipment

AN APPEAL is being made by the Museum of the Kiaotsi Railway Middle School to manufacturers and commercial houses in other parts of the world for contributions to the museum in the way of models, apparatus, drawings, statistical reports, photographs and other prints, specimens and samples of materials and parts; in fact, anything that has an educational value to the embryo Chinese railway technician. The gifts may bear any inscription, but should carry no conditions as to their use. The school was established and is supported by the Kiaochow-Tsinan Railway for the purpose of training young men for the railways. All communications should be addressed to K. T. Woo, managing director, Kiaochow Tsinan Railway Administration, Tsingtao, China.

Is the Shop the "Goat"?

AT THE office of the Arrow Manufacturing Company the president, John H. Peters, sat behind his desk in conference with his sales manager, Jim Henry, production superintendent, Joe Kayser, time study man, Dick Doran, and Bill Holland, the latter as a listener-in.

"We've got to get costs down," said Jim Henry, starting the meeting, and looking at Joe and Dick.

"Same old story, Jim," returned Joe. "Why pick on us? The only costs you ever think of are those in the shop. It's about time you looked somewhere else."

"But where else can we look? *You* make the things, don't you?"

"Yes, Jim, we make them, and we've got the costs down so low now you can hardly find it on the books. But you *sell* them, and you might take a slant at the costs in your own department for a change."

John Peters looked a bit surprised, swallowed a couple of times, and asked Joe to proceed.

"Well it's this way, Mr. Peters. Jim doesn't seem to realize much about any costs except direct labor. He thinks if we speed up a lathe or a drill, we ought to cut the cost every time he asks us."

"Don't exaggerate, Joe. Jim isn't unreasonable. Just what do you mean?"

"If Jim's reasonable, then I'm an oyster, Mr. Peters. He came to me last week to know if I couldn't cut twenty dollars off the shop cost of those vending machines if he boosted the order to five thousand a month."

"Well, couldn't you?"

"I'd like to, Mr. Peters, just to please you. But I don't quite see how I can, because the total labor cost now is under twelve dollars. If Jim can get twenty out of twelve, he'd better take my job. I'll bet he could save half the amount on his sales expense if he tried."

"Then where is the cost, Joe? You surprise me. Where does all the cost come in?"

"That's the trouble, Mr. Peters," went on Joe. "Most of you people up in the office think all the cost is in wages, but it's frequently the smallest part. There's material, tool expense, machine cost and maintenance, power, insurance, depreciation of the plant, and forty other things—but worst of all is sales. Why, it costs Jim four times as much to sell that box as it does me to make it in the shop."

"But you don't understand sales, Joe," Jim began. "It costs money to keep salesmen out, to put on exhibits in different cities and all the rest."

"Don't I know it, Jim. But while you're asking me to cut costs in the shop, do you ever study cost-cutting in your own end? If my men dawdled along as your clerks do, those boxes would cost you a lot more money. The interest on the furniture and rugs in your office would help quite a bit in cutting total costs. And it's just possible that you might save a few dollars on some of your entertaining. Perhaps you can't, but I'm a bit sick of being the goat on all occasions."

"What about it, Mr. Holland?" asked president Peters, still somewhat abashed at the outburst.

"I find a lot of production men feeling as Joe does," replied Holland. "They have been squeezing down costs for years, cutting a cent here and two or three cents there. And they see wads of money spent for things that seem unnecessary—to them. Perhaps the production man isn't the one to judge whether all these expenses are necessary. But when he has to haggle over the cost of new machines and tools, and have a battle every time he puts in a new piece-rate, he wonders whether some of the frills in the sales department couldn't be cut too."

"And is anyone doing anything about it, Mr. Holland?"

"Yes, Mr. Peters, I'm glad to say they are. At the last S.A.E. meeting I attended, managers and time-study men said that they were beginning to watch departments other than the shop. They are

studying lost motion in the office, with methods similar to those they use in the shop. They find that with fewer forms they can use less clerical help, and that cutting the inventory often makes a considerable saving. The encouraging point is, Mr. Peters, managers are beginning to realize that shop costs are nearer rock bottom than a lot of other costs."

"That's the best news I've heard in forty moons," said Joe as he looked at Jim Henry.

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

The "Can't-Be-Done" Man

Of course, the example cited by Mr. Holland is such that it leaves little room for argument. But if it is supposedly an illustration of a general condition such as one might reasonably encounter in the majority of similar situations, then I believe it might be interpreted as the exception that proves the rule.

I believe that experience does mellow a man's judgment, and that it tends to found his decisions on sound facts. I believe it is good for an executive to have about him some men who can, and do, say "No" on occasion, if only for the good it does him to crystallize his ideas in attempting to convince those who differ.

An idea too readily accepted may often never reach its full stage of development, some of our best work is done under the most trying circumstances. Isn't the fact that people say, "It can't be done," a spur rather than a deterrent?

That experience may be a handicap to some people in making them too self-satisfied with doing things as they have always been done, goes without saying. But to the majority, experience is a valuable asset. So let the progressive young man drive, but put a few old hands in the crew in case the brakes are needed. —AUGUSTUS S. GWIN.

Overhead and Profits

The easy ways of doing business in former days have led many present day organizations into difficulties. All other departments of an organization have had to keep abreast of the times, yet somehow the accounting department has held to the old order of things with dogmatic persistency. The truth is that in those earlier days, all of the intangible and more or less unknown factors worked in their favor, but today the opposite is more nearly true.

To one who approaches the problem with the mind of a production man or engineer, the logic of Bill Holland's inclusion of interest on capital investment and depreciation based on replacement values in figuring overhead, is so apparent that the only wonder is that the accountants haven't seen it long before this. It is really up to the accountants to get in the modern parade, for if they don't, it is certain that they will be reorganized by men better trained in modern production than they are, and who fortunately are not steeped in the traditions of old line bookkeeping.

—HARRY J. EISER.

Preventing Unfair Rejections

When the Milltown concern gave the motor company an estimate on the job to manufacture its gears, it assumed that the close tolerances would be changed, and made a low price in order to get the job. Therefore, when Brown and Wilson ignored the close tolerances on Parker's orders, the motor company was justified in rejecting the gears when they proved noisy.

The Milltown company should accept the rejections, forget the "crimp" it puts in the profits, and figure on enough future business to make up for it. Without question, working to very close tolerances costs more than working to liberal ones, and in future the estimates should allow for it.

—A. GENTNER.

Discontinuing Old Models of Machines

In the course of manufacturing a mechanical device over a period of years many improvements will be developed. Most of these can be incorporated in the machine without creating much disturbance. Frequently, the usefulness of these developments are important enough to cause radical changes in the design, thus requiring a new model. Often the new model can be manufactured and sold on a lower price level than the old one.

When an improved model has been perfected and established on an economical manufacturing basis, all sales effort should be discontinued on all older models which the new one replaces. There will still be some demand for the old model, enabling the manufacturer to dispose of all he has on hand or in process of being completed. A date should be set for the discontinuance of the old model, and all prospective buyers of it should be notified that after that date it will be made only on special order.

The introduction of an improved model into any well established field usually causes disarrangement of the plans of the manufacturer. But well directed sales effort will generally reduce this to a minimum, and raise the sales position of the new model higher than that formerly occupied by the old. —L. O. BROWN.

Chip Disposal

in a Screw Machine Product Plant

Fig. 1—The mixture of chips and screw - machine products is taken from the machines to the centrifugal oil extractors in pails. The products are carried away from the extractor on a conveyor and the chips on trucks

Fig. 2—Regular schedules are maintained by this electric tractor in carrying the turnings from the oil extracting machines to the outside storage pit

Photographs by courtesy of The National Acme Company

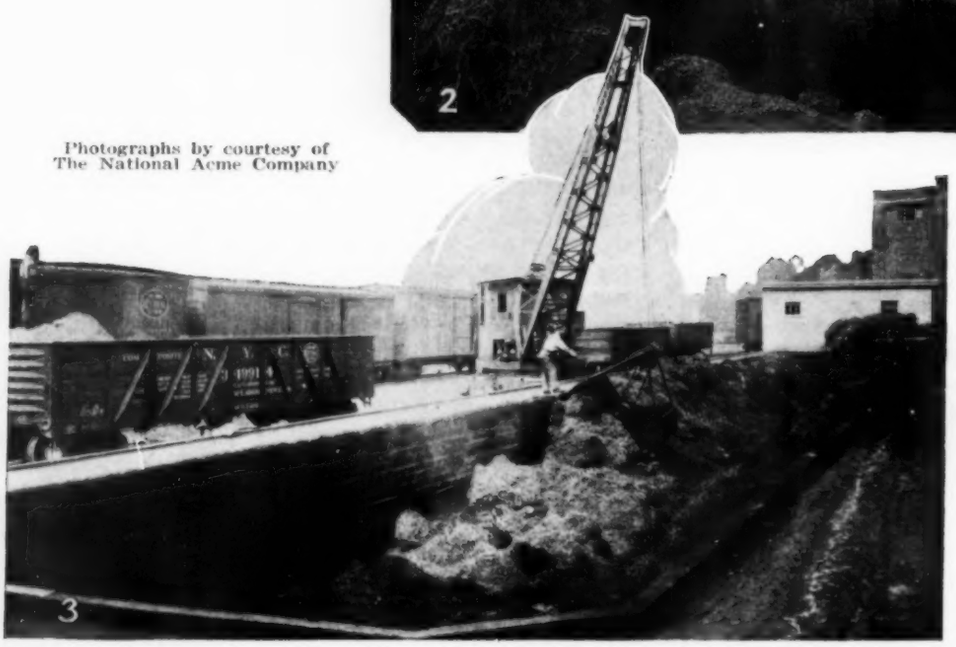


Fig. 3—Chips are taken care of by the equipment shown at an average rate of about one carload per day. The substitution of machinery for hand operations does away with much of the disagreeable and expensive features of chip disposal

Fixtures for Production Milling

By Frank W. Curtis
Western Editor, American Machinist

Rigidity and accuracy of holding, and proper design of fixtures for quick set-up are important items in the cost of machining parts

THE milling machine, recognized as an important factor in quantity production, depends very much upon the efficiency of the fixture used with it. The efficiency of a fixture is based upon the accuracy and rigidity with which it holds the part to be machined, the ease of placing and fastening the part, chip clearance, safety, and economy of upkeep. The different types of fixtures shown herewith embody some of the factors important in practical methods of finishing various forms of surfaces by milling.

An adjustable fixture that combines two operations is illustrated in Fig. 1. The part is an indicator liner, made of pressed steel, requiring both straddle and form milling to complete the surfaces at its operating edges. Due to the difference in the two sets of cutters, both cuts could not be made together satisfactorily, if it were not for the adjustable work-holding sections, because uneven wear in the cutters would cause difficulty.

The cross-sectional view at the right illustrates the relative position of the two parts as clamped in the fixture. The work-holding sections *A* and *B* are tapered on their lower faces, which correspond to the joining faces of the fixture base. Horizontal adjustment of the work-holding sections is made by the screws *C*, while clamping is done by the screws *D*, one of which is used for each section. At the under side of the base are located two shoulder studs and two plates for each section, which hold the work-holding sections to the base firmly and yet permit them to slide.

The locating surface on which the part rests is made of three hardened blocks. Alignment of the work is by three locating plugs, while clamping is by the three clamps shown at *K*. Different sizes of liners are also accommodated in the fixture by merely attaching additional hardened locating blocks. A first-operation profiling fixture for a cast-iron frame of irregular design, somewhat difficult than the ordinary to locate and clamp, is illustrated in Fig. 2. The surfaces being machined are at three different planes as shown at *A*, one of which extends across the top face of the frame, thus making it necessary to arrange for clamping below this surface. The work is located from three stationary knife-edge locators, *B*, *C*, and *D*, two of which are cylindrical. The part is registered from a rough surface on three locating blocks, *H*, *J* and *K*, the one at the right being a plate and the other two being plugs. For the projecting portions of the work, three jacks are used as illustrated at *L*. Clamping is by two adjustable knife-edge clamps *M*. Inspection of the work is made by the surface gage *N*, which checks the overall height of the work from the fixture pad *O*. The fixture is well arranged, compact in design and embodies several good points applicable for milling flat work.

Another profiling fixture for the same part is shown in Fig. 3. In this case, however, the work rests on two stationary blocks and a plug, since the entire underface has been previously machined. Due to the irregular contour of the work, a floating-type knife-edge clamp is used to grip the central portion of the frame. This clamp is operated by adjusting the slide *A* to the work, which likewise draws the circular knife-edge *B* against the opposite face. Then, after the other clamps *C* and *D* have been adjusted, the floating clamp is locked in place by the lever *E*. Three separate planes, also machined in this fixture, are checked by gages similar to those previously described. The end mill is set for the different machining heights by a step block located on the machine. A fixture for milling a large variety of keys is illustrated in Fig. 4. The key blanks, machined four at a time, are located and clamped at the top face of the fixture between vise-type jaws. Interchangeable locating blocks are used, so that various shapes of keys can be accommodated. The work-holding section of the fixture has two movements, a vertical adjustment to regulate the depth of the

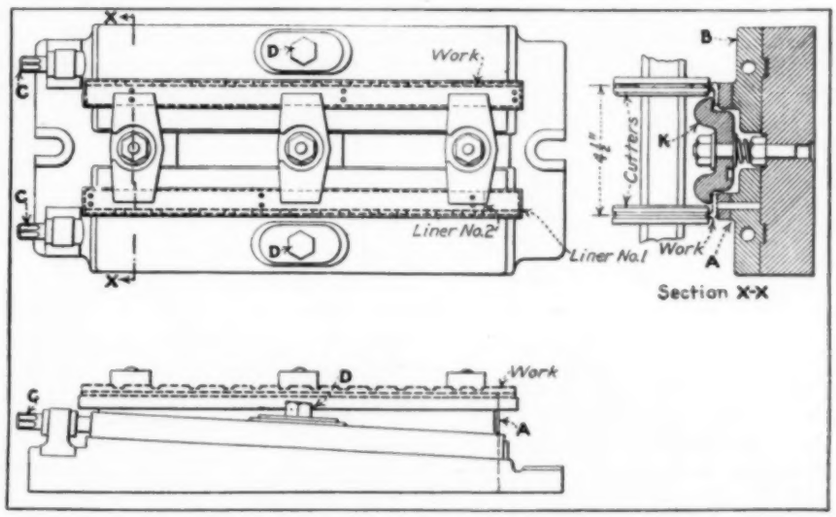


Fig. 1—A milling fixture having two adjustable work-holding sections arranged to handle two operations at one time. The work-holding sections are mounted on angular slides, so that their movement can be made to compensate for the relative wear of the cutters. By changing the locating blocks, the fixtures can be arranged to accommodate different sizes of work

The first part of the article. The second will appear in an early issue.

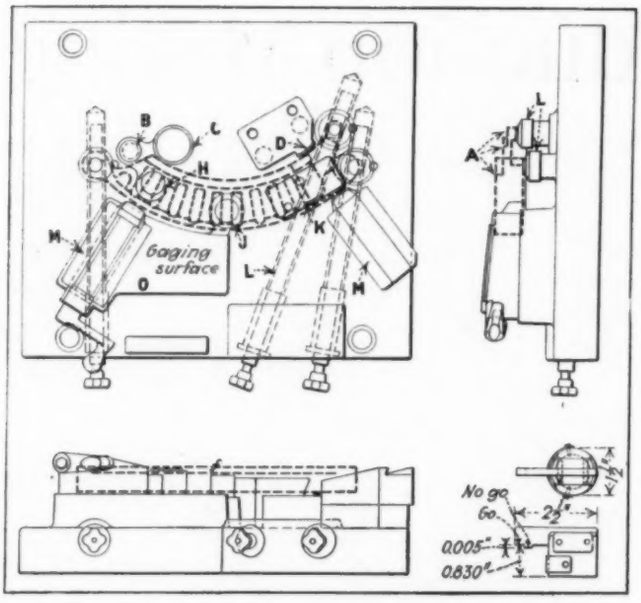


Fig. 2—A fixture for milling a part of irregular design, requiring surfacing in three planes. The operation is performed on a profiling machine equipped with set-blocks to adjust the spindle vertically. Knife-edge clamps and jacks are used to hold the piece in place

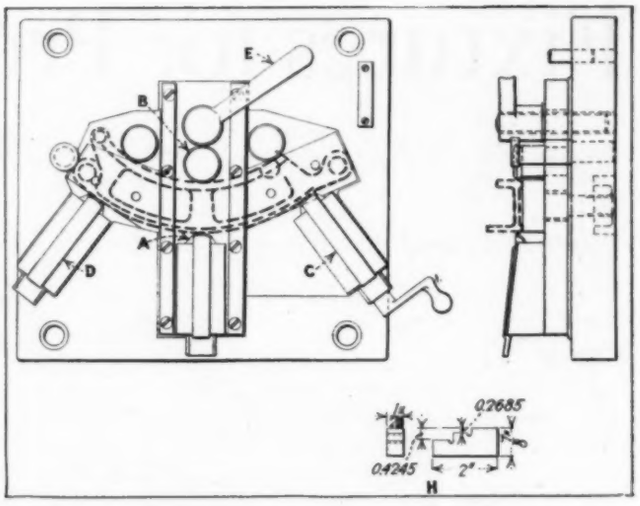


Fig. 3—A profiling fixture equipped with a floating knife-edge clamp that operates in connection with two stationary clamps. Location of the work is from two stationary blocks and a locating plug. As in Fig. 2 the work is machined in three different planes

cut, and a horizontal adjustment that shifts the keys for the different notches. By changing the master blocks *A*, various combinations of notches can be milled. With the work in place, a shift is made by raising the fixture with the lever *B*, after which the top slide is moved horizontally by the lever *C*, acting upon the block and pin *D*. The slide is locked in position by the pin *E*, which fits into either of five bushings. The locating finger *J* rests on one of the hardened plates of the master block. The weight of the fixture is sufficient to hold it in place rigidly enough for milling.

A milling fixture, used in an automatic gear-cutting machine, for slotting the inside face of a circular frame, is shown in Fig. 5. Three pieces are accommodated in the fixture, being clamped by three swinging clamps that hold the edges of the work as shown at *A*, and by three sliding clamps *B*, which grip the central section of the work. A formed cutter is used to cut the slots. The sectional view at the left shows the relative location of the work and the cutter, as well as one of the sliding clamps that grip the work close to the edge being machined. A special cutter head *C* is used in consequence of the limited space available for the cutter to travel. On the arbor is mounted the gear *D* which in turn drives the auxiliary arbor *E*, on which the formed cutter is mounted.

Circular milling fixtures are used extensively when quantity production is required, and are made in a variety of types, depending upon the class of work being handled. Such fixtures permit the application of self-operated work-ejecting devices, self-operating clamping mechanisms and auxiliary drives. These features can be applied to either horizontal- or vertical-type rotary fixtures.

A vertical-type circular fixture for milling a tongue on a small cylindrical part is shown in Fig. 6. The fixture has six equally-spaced work-holding sections located on the revolving portion. This portion is operated by a belt-driven pulley *A* and worm gearing at *B*. The features of the fixture are the automatic clamping and ejecting mechanisms.

In loading the fixture, a piece of work is placed in the jaws at *C*, then as the fixture revolves the action causes the arm *D* to tighten the adjustable jaw against the work. This movement is caused by the roller *E*, attached to the arm that operates in the cam race *H* of the stationary member *J*. The cutters are positioned on the same plane as the center line of the fixture, and milling is done when the work reaches *K*. After passing the cutting position, the work travels downward a short

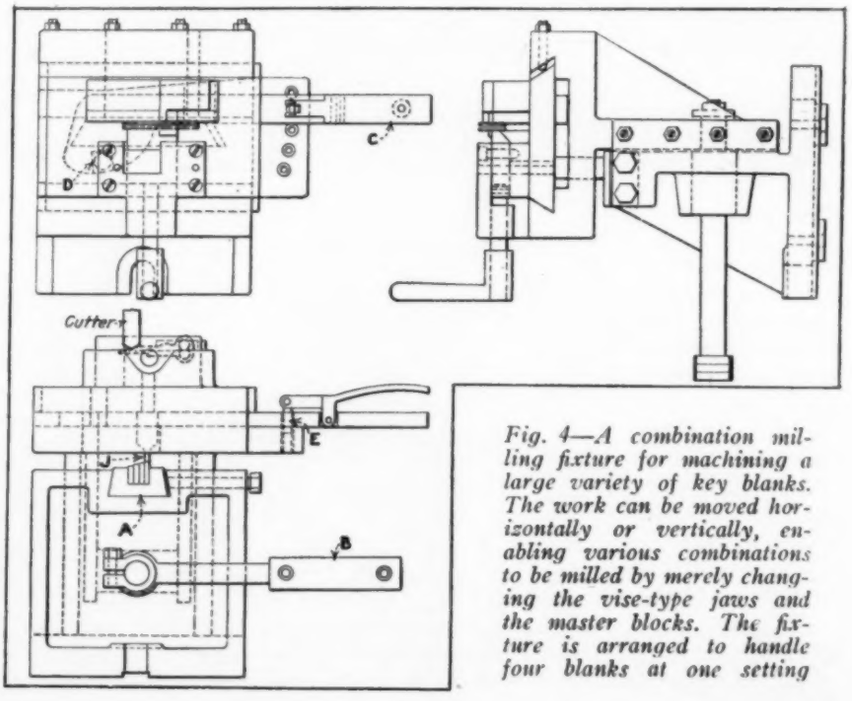


Fig. 4—A combination milling fixture for machining a large variety of key blanks. The work can be moved horizontally or vertically, enabling various combinations to be milled by merely changing the vise-type jaws and the master blocks. The fixture is arranged to handle four blanks at one setting

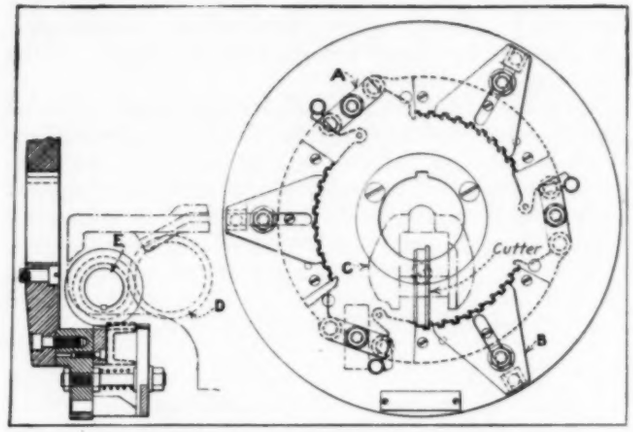
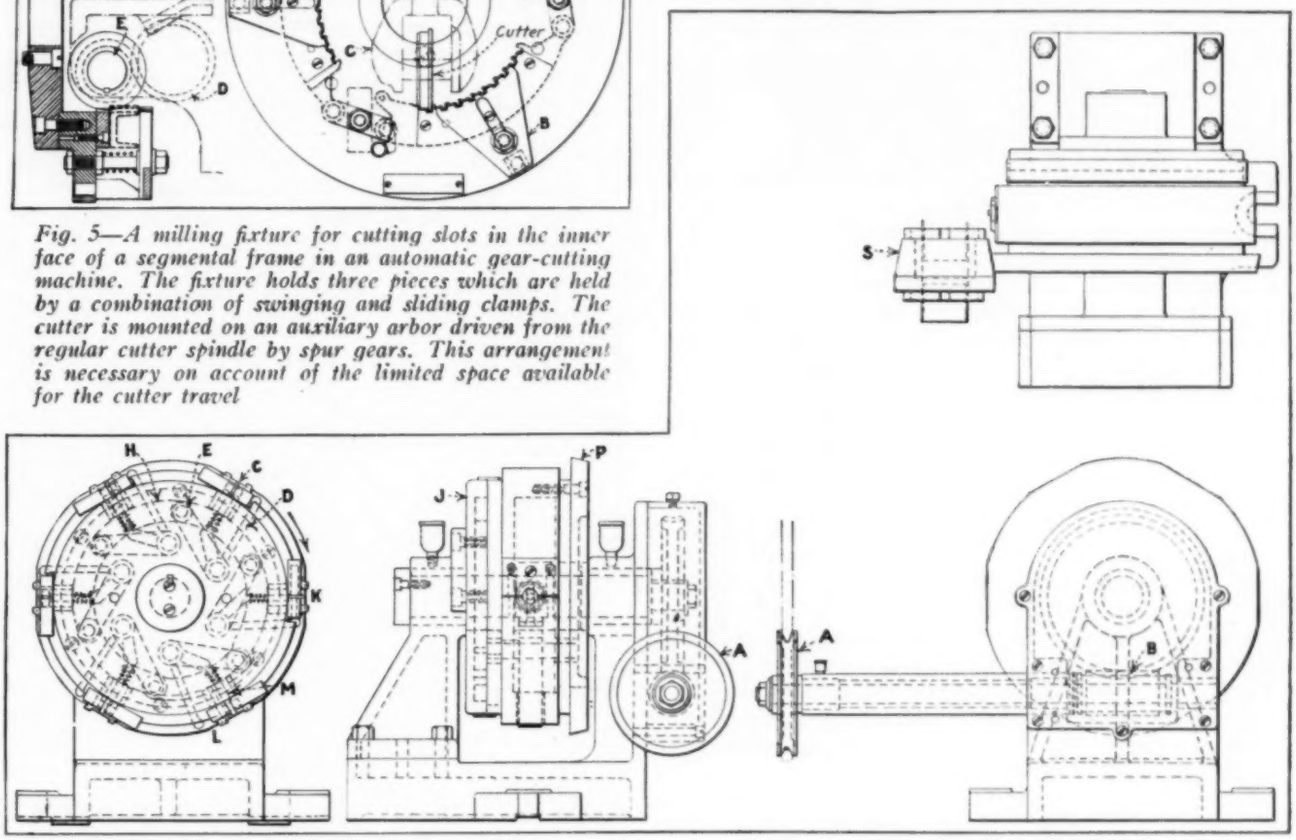


Fig. 5—A milling fixture for cutting slots in the inner face of a segmental frame in an automatic gear-cutting machine. The fixture holds three pieces which are held by a combination of swinging and sliding clamps. The cutter is mounted on an auxiliary arbor driven from the regular cutter spindle by spur gears. This arrangement is necessary on account of the limited space available for the cutter travel

Fig. 6—A rotary milling fixture that clamps and ejects the work automatically. The operation is the milling of a tongue at the end of a small cylindrical part. The work is clamped by a cam-operated arm, and is ejected by a similar mechanism. By using a camplate and roller, the surface of the work is machined straight



distance where it is automatically ejected by a finger, integral with the arm that operates the clamping jaw. The ejecting position is indicated at *L*, where the finger is shown in the outward position against the ejector *M*. This motion may also be operated by the roller and cam.

With a rotary fixture, the natural shape of any milled surface would be convex. Since a flat surface is required, the fixture is provided with a cam plate *P* and a cam roller *S*. The feed screw of the milling machine table is disconnected, and a rope and weight provided to keep the cam against the cam roller. The edge of the cam opposite each set of work jaws is formed so that the milled surface is flat.

Co-operation or Planning?

By L. B. Jones
Schlage Lock Company

WE HEAR a great deal about the need of co-operation in our work; how co-operation is the lubricant that reduces the friction of our interdepartmental contacts, speeds up production, and is, in fact, the panacea for most of our manufacturing problems. We are to believe that Mr. Smith, who runs the assembly line, when in need of parts X-100, should go to Mr. Brown of the shop and request that these parts be speeded up for the sake of co-operation.

Mr. Brown is supposed to be working on scheduled deliveries, so he looks up the delivery date for X-100 and finds that these parts are not due for some days, and further that although they are well along in process, there still remains considerable work to be done before they are ready to leave his department. Of course, Mr. Brown wants to be a good fellow, and with co-operation ringing in his ears he agrees to move up parts X-100, and rush them. To do this, he naturally has to delay other work which is due, but as long as no one has been in to bother him, he lets it slide. The electro-plating department was probably counting on those parts to keep equipment in operation, but no matter, co-operation has had its say.

Much of the talk about co-operation is made to cover up inefficient planning and management. Provided that the material is on hand, the work properly planned and routed, and each department head held strictly accountable for prompt deliveries, where does co-operation enter?

· BOOK · REVIEWS ·

MY PHILOSOPHY OF INDUSTRY. By Henry Ford. An authorized interview with Fay Leone Faurote. One hundred seven pages, 5x7½ in. Cloth boards. Published by Coward-McCann, Incorporated, New York. Price $1.50.

Four short essays are included in this volume: Machinery, the new Messiah; My philosophy of industry; Success; and Why I believe in progress. In them the reader finds an interesting picture of the way in which Mr. Ford's mind works. For instance, "Machinery is accomplishing in the world what man has failed to do by preaching, propaganda, or the written word." And again, "As with a properly tuned antenna, thoughts seem to come to one attuned to receive them. That seems to be the way to get ideas, but it takes a conscious effort on our part to receive them. Call this universal source of ideas anything you wish, the fact remains that the thoughts are all around us ready for acceptance. They come from outside us, from a source that we may not know, but they are nevertheless available when we put ourselves into the right mental condition to receive them."

Mr. Ford believes that "Abraham Lincoln and Benjamin Franklin both thought in fundamentals. They would be just as much at home in our civilization of today—just as valuable contributing members of our society—as they were in the age in which they lived. The truth they knew still persists." He says further, "One of the hardest things in the industrial world today is to find enough men who are capable of thinking a problem through, executives who can do the job without further supervision or additional prompting."

One could go on quoting Mr. Ford's pithy ideas on all sorts of things but enough has been given to show that although the reader may disagree violently with some of the beliefs of the automobile genius it is well worth while to read what he has to say.

MECHANICAL WORLD YEAR BOOK, 1929. Three hundred forty-eight pages, 4x6¼ in. Published by Emmott & Company, Ltd., 20 Bedford St., London, W.C.2, England. Price in England, 1s. 6 d.

FOR the forty-second year, this year book comes from the press containing many useful tables and suggestions that apply mostly to steam and gas power plants. Among the sections which have been increased in size in the 1929 edition are those on helical springs, fly-wheel proportions, compressed air, wire ropes for cranes, and belt conveyors.

PHOTOMICROGRAPHS OF IRON AND STEEL. By Everett L. Reed, instructor in metallurgy in Harvard University, with a foreword by Dr. Albert Sauveur, Gordon McKay professor of metallurgy and metallography in Harvard University. Two hundred fifty-three pages, 6x9 in. Published by John Wiley & Sons, Inc., New York. Cloth board covers. Price $4.

TWO-HUNDRED eighteen photomicrographs of the most important commercial irons and steels have been arranged by the author in systematic order as a reference work on the structure of these materials when subjected to commercial heat-treatments. In each case the composition, heat-treatment, etching solution, and magnification are given, and in many cases a brief description of the structure.

The book is suitable for engineers who wish to extend their knowledge of the structure of engineering materials. It should also be helpful in everyday discussions between engineers and metallurgists, somewhat as blueprints are helpful in discussions of machinery. The appendices on definitions of terms make it unnecessary for the engineer to refer to other books for these terms. It should be a great help when used side by side with the standard reference works on steel and its heat-treatment.

ADB WERKZEUGMASCHINENBLÄTTER (MACHINE TOOL SHEETS). Prepared by Prof. Dr.-Ing. E.h.E. Toussaint, with the assistance of the local section of the Society of Industrial Engineers (ADB). Published by Beuth-Verlag GMBH Berlin S14, Dresdener Str. 97. Price for the full set 9 rentenmarks.

IN HIS explanatory introduction the author of these machine tool diagrams or sheets points out the difficulty encountered by the machine tool user in getting complete information about the operation and construction of the machines. Some of it can be obtained from catalogs and some from instruction books but in few instances is it complete. These sheets were prepared because of frequent requests from practical engineers for the sort of data they contain. In some cases the most up-to-date machines are not shown because they are not in general use. In other cases suggestions are made that should lead to improvements in design.

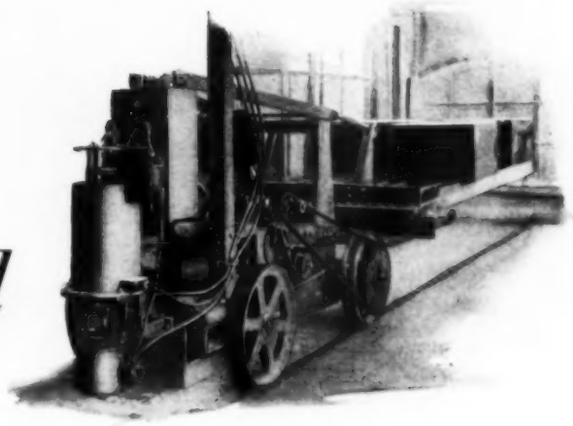
There are nominally 40 of these loose-leaf sheets but most of them have several extra sheets of supplemental data so that the total runs to perhaps three times that number. There are sheets for lathes, planers, shapers, upright and radial drills, milling machines, and plain and cylindrical grinders.

The data sheets are purposely kept general, and are intended to convey the fundamental design principles, rather than specific operating data. For example, in the case of a shaper the velocity diagram of the slotted arm drive mechanism is explained, and the formulas for working out the resulting speeds are given for the general case. Numerous charts are used throughout, particularly to convey information as to desirable combinations of feeds and speeds. In the case of geared heads for lathes and the like, where a fairly universal system is used for lever positions, the general formulas for calculating the corresponding speeds are given.

UNIFORM THROUGH BILL OF LADING. This 62-page, 6x9-in. pamphlet, by A. Lane Cricher, assistant chief of the Transportation Division, Bureau of Foreign & Domestic Commerce, gives a very complete digest of information on the use of the through bill of lading for shipments. This through bill is a document covering the carriage of goods from an inland factory in the United States to a point in a foreign country. It is a combined rail bill and ocean bill, and up to the present there has been considerable confusion in the minds of manufacturers as to its proper use. The present pamphlet will give the American manufacturer a clear picture of how to use the through bill in his foreign shipments. It can be obtained for ten cents from the Superintendent of Documents, Washington, D. C.

ENAMELING OF REFRIGERATOR PARTS *Simplified*

By Automatic Charging Bogies



Layout of an enameling department in which materials move in a machine-like manner from one operation to another

ENAMELING of sheet-metal refrigerator linings is expedited at the plant of the Leonard Refrigerator Company, Grand Rapids, Mich., by the use of automatic charging bogies, operated by remote control, for charging and unloading the work, which has the various coats baked on in electric ovens, a separate oven being used for each coat. The bogies were developed primarily to simplify the handling of the work through the baking ovens, by eliminating the human element needed to manipulate the hand-operated charging forks. Additional economies that have resulted are: A reduction in the time consumed to complete a loading or unloading cycle; a reduction of heat loss for the cycle, and a more uniform product. These factors have been responsible for a considerable increase in production, and have resulted in lowering the power consumption of the ovens.

The ovens served by the automatic units are electrically operated, and are equipped with a door at each end, one for loading and the other for unloading. The fork, which shoves the work into the furnace or removes it, is carried by an electrically-operated charging bogey, which operates on tracks located in line with the heating chamber of the oven, as illustrated in the headpiece. Two bogies are used, one at each end of the furnace for loading and unloading, respectively.

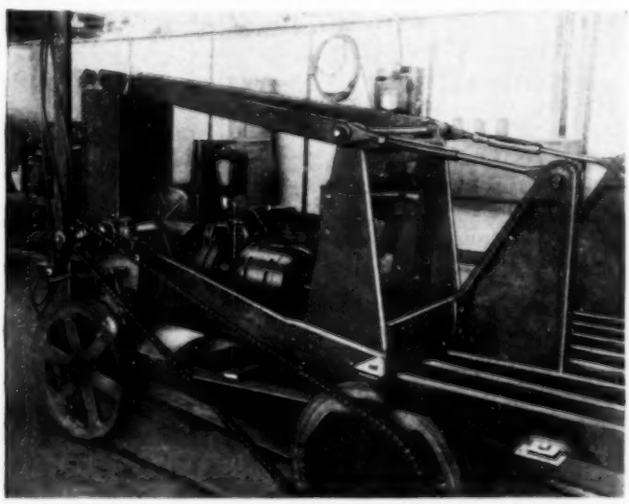


Fig. 1—One of the automatic bogies, showing the carriage and the motors used for driving and operating the elevating fork. Current for operation of the unit is received from an overhead trolley, and remote control is used

With a load of parts positioned on the loading fork arms, loading is completed in 15 sec. With the hand-operated forks formerly used, the cycle required from 30 to 35 sec., permitting the temperature of the furnace to drop approximately 100 deg. F. The present temperature drop is only 50 deg. F. With the heat loss reduced, the baking time has been shortened by 15 sec., and a charge is now baked in 3 min., resulting in a minimum reduction in floor-to-floor time of 30 sec. per charge.

A portion of one of the unloading forks is illustrated in Fig. 1. It is driven by a 2-hp. motor through a chain drive connected to a sprocket on one of the front wheels of the bogey. Vertical movement of the fork arms is obtained by means of a ¾-hp. motor that drives a worm screw. Both motors are of the reversible type.

Control of the automatic unit is by a series of electrical buttons located in a convenient position at the front of the oven doors. To start a cycle, the operator engages the starting-switch button, thus causing the drive motor to actuate the fork into the forward position. The same switch is connected to a ¾-hp. motor positioned above the oven door. This motor opens the door through a screw feed. When the fork has reached the innermost position, the current feeding the driving motor is cut off automatically and the fork is brought to a halt by means of a solenoid brake. The operator then presses a second button, causing the smaller bogey motor to drive the fork elevating screw, so that the fork arm raises the work from the floor of the oven chamber. A third button is then pressed, causing the bogey to withdraw the fork from the oven. The bogey stops automatically, when the fork clears the oven door. Finally, the motor connected to the oven door starts automatically, thereby closing it and completing the unloading cycle.

The charging bogey operates the charging fork in a similar manner with the exception that the furnace door has two vertical stops, which must be considered. At this end, the engagement of the fork causes the door to open sufficiently to permit the charge to be passed under it. As soon as the charge has entered the oven, the door is lowered to the level of the fork arm, and is brought to a temporary halt. The fork arm is then lowered, so that the work is placed on the oven floor, after which the unit

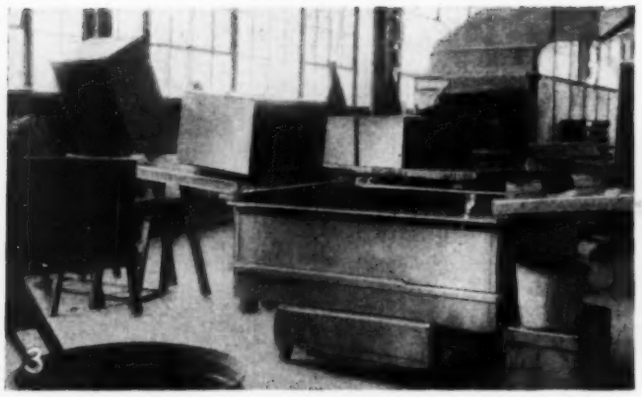


Fig. 3—One of the slush tanks used in applying the ground coat. After the work has been dipped, it is placed on a rack to drain, and is then placed on the conveyor of the first drying oven.

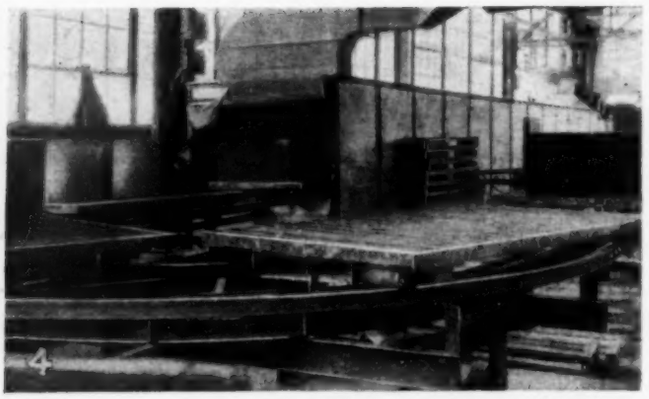


Fig. 4—One of the drying ovens and the conveyor that passes through it. Enameled parts are dried at 150 deg. F., thus preparing the coat for baking. The baking ovens are positioned adjacent to the conveyor

is withdrawn. As soon as the fork has been fully withdrawn, the door is lowered to the closed position. The purpose of having two door stops is to avoid an excessive heat loss during the charging operation. Current for operating the motors of an automatic bogey is delivered through an overhead trolley. The make-and-break circuits are controlled by solenoids mounted on the carriage. This type of operation permits a perfect synchronization of the travel of the charging carriage and the opening and closing of the oven door. The respective movements are quite rapid and little time is lost in performing them. Six electrically - operated furnaces are used in the enameling department. Each furnace is equipped with automatic heat control. A layout of the west end of the department is illustrated in Fig. 2. The east section is made up of similar equipment, having its discharge end located close to the discharge end of the section shown. Work is received at the slush tank shown at the lower right where the parts are first inspected, then hand dipped and placed on a drain. Before the work reaches this point, however, it is thoroughly cleaned, since even slight amounts of foreign matter or dirt will cause the enamel to peel or flake after it has been applied and baked.

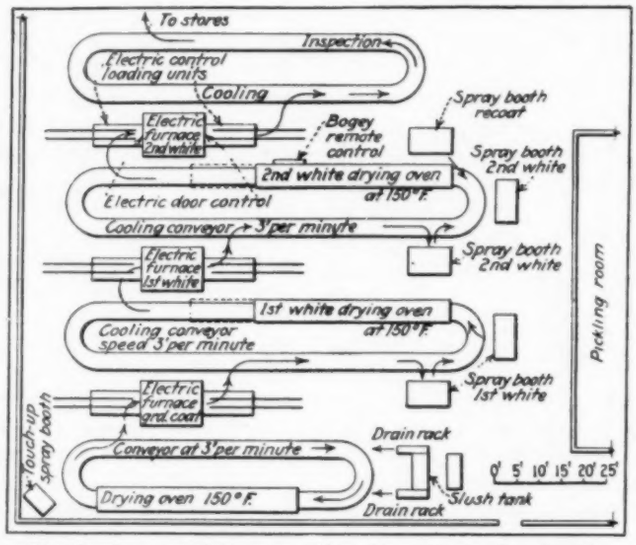


Fig. 2—Layout of the enameling department showing the procedure carried out in passing the work from the pickled stage to the final inspection after enameling. The operations include drying and baking a ground coat and two white coats. The department has been laid out to simplify handling

After leaving the drain rack at the slush tank, the work is placed on a conveyor and enters a drying oven maintained at 150 deg. F. The conveyor travels at a speed 3 ft. per minute, thus permitting the work to remain in the drying oven 15 min. At the discharge end of the oven is located a spray booth, in which touching up is done. The work is inspected as it passes the booth, and only those pieces which have not received a satisfactory coat are taken off. If all right the work proceeds around the conveyor until it is removed for the baking of the ground coat. After the work has passed through the first baking oven, it is placed on an adjoining endless conveyor, also traveling at the rate of 3 ft. per minute, and proceeds to either of the two spray booths at the right end, where the first white coat is applied. After being sprayed, it is again returned to the conveyor and passes through the first white drying oven for 15 min. This drying oven is also maintained at 150 deg. F. The work is removed opposite the charging end of the first white coat baking oven, passes through this unit, and is placed on a third conveyor. The work next passes through more spray booths where the second white coat is applied. Then through a drying oven, and finally through the last baking oven. Following the final baking, the work is placed on a conveyor where inspection is made. Upon removal, the work is transferred to the stores department or to the final assembly line.

The department has been laid out to simplify the handling of material, and to avoid any so-called "backtracking." Once a piece is started in process, it progresses continuously until it reaches the final inspection conveyor. The electric drying and burning ovens and the conveyors are so positioned that the transfer of work from one unit to the next is done with a minimum of travel. The same feature applies to the spray booths, which are located conveniently to the conveyors and enable the work to be removed without much effort.

The ground coat is baked at 1,600 deg. F. for approximately 3½ min. The first white coat is baked at 1,560 deg. F. for 3 min., and the final white coat is baked at 1,540 deg. for the same length of time. The porcelain used is of the medium-fusing-point type, and has a high coefficient of expansion on account of the size of the work handled. The expansion of the material used is about $\frac{1}{8}$ in. to the foot.

Approximately 30,000 sq.ft. of enameled surface is the capacity of the department for an 8-hr. period, when the

Fig. 5—Spraying a refrigerator lining with the first white coat, following the baking of the ground coat

six ovens are in use. In Fig. 3 is illustrated one of the slush tanks, showing the draining racks located at either side, and in Fig. 4 is shown the oven used for drying the slush coat. The other drying ovens are of similar design. One of the spray booths used for applying the first white coat is illustrated in Fig. 5. The work is placed on a revolving stand so that it can be turned as desired.

The Value of a Shop Library

By Joseph Viggiano

MANY an employee would gladly fit himself for greater opportunities, but he does not know where to get his information. In fact, he does not know what things he ought to study. It is not always lack of desire to make good that keeps workers behind, but lack of knowledge of just how to go to work to succeed.

In the installation of the company library and of various educational courses for his employees, the executive puts within reach of the people under him an opportunity to better their positions under skilled leadership, to lift themselves out of routine and to broaden their scope.

Every conscientious librarian takes a personal interest in all members of the organization whose interests can be furthered by the use of the library. This includes the rank and file quite as much as the executive. Where educational courses of study are being carried on, any information that would be of value to members of any class should be sent to the instructor in order that he may pass on a digest to the students. In the case of individual members of the organization who have registered an interest in any given line, the librarian might furnish a bibliography for a reading course.

Catalogs covering his company's product, and similar lines of work in other plants, should be available to the worker. Further information should be furnished by means of technical magazines and folders. These should be read by the librarian, the names of the men who would be interested written on the outside, followed by the number of the page on which the article is to be found. When the magazines are finally returned to the library, after completing their rounds, they should be taken apart, and the desirable illustrated advertisements and marked articles filed in binders. The articles should be listed and all departments notified of material on hand. Library work of this nature would be constructive.

SEEN · AND · HEARD

By John R. Godfrey

Push Broaching—Finish for Piston Rings—Jig Borers

BROACHING continues to grow in favor for many operations. But there is still great diversity of opinion as to whether the "pull" or the "push" broach is to be preferred. A broach maker recently told me that his customers seemed about equally divided, with a tendency in favor of the push broach.

Much to my surprise he showed me an example of push broaching that was contrary to many previous notions of this work. For, in most cases that I have seen, the work done by the push broach was comparatively short, rarely over 3 in. This, however, was a hole of perhaps an inch and a quarter in diameter, through the center of a forging about 9 in. long. And the time required was much less than formerly taken.

The making of broaches too, is quite a problem in many ways. For, as with many other expensive tools, the most ticklish operation—hardening—comes after nearly all of the work has been done, and the hardening of a long, slim broach is no child's play. Fortunately, the newer heating furnaces permit much better heat control than formerly, and the steel makers have learned to give us steels that are marvels as to uniformity and other desirable qualifications.

* * * *

Opinions have always differed widely regarding the best finish for cylinders and piston rings. In the steam engine days some engineers demanded cylinder bores left with comparatively rough finish by using a tool and feed that would leave slight ridges instead of a dead smooth bore. The idea was that the piston rings would "wear-in" sooner and so fit better, preventing practically all leakage of steam past the rings.

Similar differences of opinion existed in the early days of the automobile engine, but the question of cylinder bore seems to have been settled by what we call honing. The best surface for the piston ring, however, is still open to dispute. Some engine builders demand the smoothest finish possible. Others prefer rings finished with a tool in which the feed marks are plainly visible. Some want a very fine feed that leaves slight ridges very close together. Others want a coarser feed to leave more space between th high parts. In both cases, however, the idea of the old steam engineers still prevails—to present a surface that will "wear-in" quickly. Both methods seem to give very satisfactory results.

* * * *

If anyone doubts that higher standards of accuracy are in daily use he need only keep his eyes open for jig boring machines in shops in various parts of the country. This is particularly true in toolmaking shops where it is not unusual to find them in shops so small that one sometimes wonders how they raised the money to pay for them. The fact that jig borers are becoming more and more common, however, indicates not only that they have been paid for, but that they are proving a profitable investment.

· THE · FOREMAN S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Spending Money for Oiling Equipment

"YOU remember our discussions about oiling machinery, Ed? Well, you ought to see the big drawing press I saw the other day. They had a copper tube run from every bearing down to a bunch of grease-gun connections on the sides of the press. Over 200 of them, Ed, and a mile of pipe to boot. Someone told me that the layout cost over a thousand dollars."

"Some firms don't care how they spend money, Al. A thousand dollars for a few lines of pipe and grease guns!"

"I've never seen any firms of that kind. All I know of are mighty canny with the check book. And I'm betting this plant manager didn't spend any thousand bucks without having a very good idea of its coming back—and soon."

"But I don't see how they can save any thousand dollars in oil, Al."

"Not in oil, Ed. That's the least item of expense in lubrication. It's the time it takes to oil thoroughly, and the time it takes to repair the machine if you don't. Missing a few oil holes can easily cost a thousand dollars. This particular press took over three hours to oil up—and the press out of commission all the time. And then there's a big chance of accident to the oiler when he has to climb up over a big press with all its cranks and slides."

"But, it would cost a fortune to put oil pipes on all the machines. Why don't they put them on when they build them?"

"Two main reasons, I guess, Ed. One reason that not many seem to realize what thorough lubrication means in production work, and the other that the average buyer is still apt to balk at paying for real oiling equipment such as this I saw. The cost seems high when you think only of copper pipe and a grease gun. But when you put even a thousand dollars alongside the cost of this particular press, it doesn't seem so much. And if you count the savings in repairs and by not losing production, it's probably the best investment in the plant."

"And does the press operator shoot the grease into the pipes, Al?"

"Not by a long way. His job is production. A special oiling man comes around regularly with a power pressure gun and gives each bearing a shot, and there's over two hundred bearings. Some job for a press operator, eh, Ed?"

"I still think it's too much money, Al, and the press man ought to oil his own machine. It would save money."

Is Ed right about the operator oiling his own machine? Or that it would save money? Or is Al's belief in the economy of a good lubricating system justified?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Shall a Man Sit Down to Work?

WHETHER a man sits down to his work or not is of little more significance as to its influence on his output, than the question whether he shall be permitted to carry keys in his pocket or not. But, when we consider specific conditions and type of work, it may be of major importance that he should not sit down, just as in the case of men working on highly sensitive magnetic development, where the carrying of keys in their pockets may influence the data recorded.

Where the nature of the work makes being on the feet essential for proper production, sitting down should be classed the same as any other interference with production. If indulged in only rarely, it should be treated with as much tolerance as the other less excusable forms of loafing. Where it does not influence the work, it is "dead wrong" to insist on a man not sitting down, merely as a matter of discipline.

—HARVEY S. HINCHMAN.

Instructors for Shop Men

THE idea of providing an instructor for unsatisfactory men is perfectly feasible, but I don't believe the proper place is in the production shop during regular hours. Ed's fear of interference from the instructor seems well founded. The instructor, dealing solely with this type of man, naturally grows to expect a lower standard of performance in quality and time than the foreman demands, as the foreman bases his standards upon the work of the best men. The instructor, by the very nature of the circumstances, will probably develop a more sympathetic attitude and the men will tend to go to him. This, of course, is bad for shop discipline.

—FRANK KAHN.

Equipment and the Foreman's Reputation

BILL JENKS realizes that he is engaged in industry with the same object as his boss, namely, making more profit for himself. If he thinks that by changing his job he can make more money, he is perfectly entitled to do so, in the same way that the boss is entitled to change his equipment if it pays him to do so. Anyway, it wouldn't do Bill's mental equipment any good to stick in the same old rut year after year, working obsolete machines.

On the other hand if Bill's old employer has been exceptionally good to him, and if he feels that if he sticks loyally to the firm, the firm will reciprocate, it is up to Bill to stay.

F. W. OLIVER WHITE, *England.*

THE · NEXT · TOPIC

Whistling in the Shop

ADVANCE QUESTION

Ed wants to post a rule against whistling in the shop. Al opposes it vigorously. What do you think?

Reading the Shop Language

IT IS the duty of a foreman to see that an operator understands the blueprint before he is allowed to proceed with the job. Every operator should be taught to read, not only blueprints, but gages, micrometers, and other measuring instruments used on his work.

No job should proceed far until the foreman has examined the work to see if it conforms to the dimensions given on the drawing. While this is being done is undoubtedly the best time to teach the operator how to perform his work.

I find that after, say, six jobs have been explained to the operator, he can read a print correctly, and I believe that this method of individual instruction is far better than instructing a number of operators in a class.

—C. L. HENRY, *Foreman, England.*

Letting Good Men Get Away

I WONDER if Ed's good man who got away was in a minor executive staff post, or, just a good mechanic or machinist? Most good men in either capacity are generally too modest or too timid to express their views as to how things should be done, hence the heads of the firm only know of their existence as being just a worker on the pay roll.

The good man, if at the restless age, is out for pay and position, and any praise from Ed would give him that conceit which would make him look for something more definite. The good man of mature age, if the shop and local conditions are right, will show more patience. The good man who gets away may be persuaded to return to fill the post should an opening occur.

—R. L. HASELGROVE, *England.*

Making Foremen—or Importing Them

THE greatest drawback of many "made" foremen is their provincialism. It is not as easy for a one-shop man to assimilate new ideas or to develop the necessary initiative, as for one who has had the advantage of an extended experience with several plants. There is much

to be urged for the sound middle course. When out of his training period, the young man can gain valuable experience by working with two or three leading competitors of his first employers. All things being equal, he is more versatile, more nimble-witted, than his colleague who has chosen to stay in one employ. Whether he succeeds in reaching higher rank or not, there is no question but that variety of experience fits him naturally for promotion. —W. R. NEEDHAM, *England.*

IN THE interest of the firm, an imported foreman would be beneficial in the end. He would be an object of suspicion for a short period, but on proving himself he would be soon taken for granted. Few men want to be foreman over their own shopmates, knowing it would create a feeling of envy, and when a man considers himself sufficiently experienced he will experiment elsewhere. —C. A. POORE, *England.*

The Boss' Son in the Shop

HAVING the son of the "big chief" in the role of apprentice should prove neither unpleasant nor a detriment to a department, especially when the big chief stated emphatically that no special favors were to be shown him.

Under conditions of years ago when an apprentice was compelled to do many menial chores the son of an executive in the shop was a real problem. As such he was likely to escape some of the menial work and to be excused from some of the unpleasant duties that fell to the lot of an apprentice. This would naturally cause ill feeling among the other boys.

In the modern shop the apprentice is kept busy at his chosen trade. We think nothing of it when a respected employee, or a foreman, brings his boy into the shop to serve his time, and this being the case why object to the son of a higher official being placed in a department to learn the business? It is far better to have the big chief's son apprentice himself and learn the business from the ground up than to have him wished on the firm as manager at some later day without the practical experience. —F. E. BIRD, *Canada.*

NEARLY all the letters on this subject have taken the view that it is better for the boss's son to learn the work in some other shop. I was brought up on that view, and it seems to be the view most generally supported by argument. But observations on the successful shops reveals an undue proportion in which the practice has been the opposite. And in each individual case, the training of the boss's son in his own shop seems to have been a considerable factor in making it a success.

There are several possible explanations of this unexpected result. The boy who is to advance to the top should be friendly with the workmen, but not too intimate. He should understand their point of view, but he should not get it. He should feel himself part of the management rather than of the mass. I have noticed in my shop that the boy from a social class considerably above the other workmen is usually liked as well or better than the son of a mechanic, but he is not treated in the same way. I suspect that in this respect the fact that he is the boss's son usually adds to distinction. I suspect that the boss's son has a real advantage in his father's shop, even though he may feel it a handicap.

Another reason is the attitude of the boy. In working in another shop, too often he looks upon it merely as a chance to get useful experience to use in his father's shop later on. He may want to make good in his job, but he is not so much interested that the business as a whole should make good.

Some have suggested that the fact that he is the boss's son should be kept secret. Even if this were possible, I think it bad practice. Some of us who have no son available, would like some boy in the shop that we could treat as a son, some boy that we could train for the top. If we could hire such a boy, we would want to advance him as rapidly as possible, right past the older employees. Most business concerns need more men at the top, and we do not want to wait till the other men in the shop recognize he should be advanced. But to treat an unrelated boy in this way is bound to cause ill feeling no matter how much his ability and how much the business needs his advancement. In the case of a son, most workmen look upon such treatment as natural even though they do not like it. Few feel as much resentment toward the advancement of the boss's son as toward the advancement of any other young man.

—A. W. FORBES, *Forbes & Myers.*

Asking a Man to Come Back

SHOULD Ed eat humble pie and ask the man he wrongfully fired to come back? Yes, it is a poor sort of human being, regardless of his status, who cannot admit error, and who will not endeavor to make restitution for an error. You cannot maintain dicipline among men who have a suspicion that their boss will never admit that he is wrong.

—BEECHER PARKHOUSE, *Canada*

THE admission of the foreman that he made an error, and the subsequent rectification of that error, by calling back the discharged workman, will not affect shop discipline adversely. In fact, when a good man is reemployed, the company as well as the workers stand to receive benefit through such an action. The workers will understand that the foreman and the company which he represents are cognizant of the employees' welfare and mean to be fair and just in their relations with the men in the shop.

However, both the foreman and the management should make certain that an error of this type will not occur again. This can be accomplished by a careful investigation of the case of every man considered for discharge for specific cause. —J. GURWITCH.

AL IS perfectly right in advising Ed to rehire Frank. If Frank is a fair-minded man he will listen to the explanation. However, if Ed finds Frank to be "swell-headed" after he tries to effect a reconciliation, he should drop the matter at once and find a new man for the position. —C. V. MCGUIGAN.

AL SHOWED the right spirit in advising Ed to reconsider his action and send for the man he had unjustly discharged. Ed should send a letter to Frank Walters explaining his hasty decision. Such an action

will be beneficial both to himself and to the concern. We all make mistakes, and Frank will probably accept the explanation and return. Of course, if the man was asked back because he was badly needed there might be an adverse feeling on the part of the other employees.

—SIGURD C. NIELSEN.

Capitalizing Criticism

UNLESS the foremen of the Star Electric Company are exceptionally broadminded, and possess considerable tact, cooperation between them will suffer if they criticise one another. A foreman takes pride in his department and resents any criticism of it.

If a department is open to continuous criticism, it would seem to indicate a lack of supervision on the part of the general foreman or superintendent. If a fault in one department is apparent to the foreman of another one, either the second foreman is not attending to his own duties, or supervision is lax. —L. F. SWANSON.

THE habit of encouraging foremen's group meetings has long been customary in industrial plants recognizing the value of such conferences. The conference acts as an incentive to better work, greater interest, and a more satisfactory adjustment of conditions.

Department heads are sometimes inclined to adhere rigidly to established methods, but a weekly conference attended by all department heads and foremen will aid in the introduction of beneficial changes. The members of the conference will take an active part, if encouraged by the management, in discussing the more serious difficulties openly, and with a sincere desire to adjust them so that they may be satisfactory to all concerned.

—JOSEPH VIGGIANO.

Does Appearance in Tools Count?

THE Evans Motor Works instructions to their toolmakers to make jigs that work and disregard appearance would be all right under some circumstances, but if they are going to build a good product and stay in business they need to make tools that appeal to the senses. It is immaterial whether all the users of the tools have all of the senses or not. Good tools properly made are pleasant to the touch and pleasing to the eye. A little polish, rounded corners, regularly spaced tool marks, with proper storage and handling facilities are the best assurance of a good product. —C. D. MICHENER.
Diamond Drill Contracting Company.

THE appearance of a tool is the outward indication of its worth. An intrinsically good tool, jig, or fixture may, if its appearance is below standard, cause adverse criticism from visitors to the plant, who are naturally influenced by appearance alone.

We are, of course, taking a common sense attitude regarding good looks. Ornamental effects are not to be considered seriously, but any layman knows when a tool or jig has a neat, business-like appearance.

From a shop standpoint, well appearing tools last longer because they are taken better care of, and create a feeling of pride in the workman who uses them.

—L. B. JONES.

How About a Christmas Party?

A YEAR ago this Christmas we gave a party to 120 employees and their families. The affair was arranged by a social committee consisting of the machine shop superintendent, the foundry superintendent, and the factory manager. Additional help was selected from among the employees in the shop and office.

The office girls made stockings from colored mosquito netting, and these were filled with the best grade of hard candies, and hung on a railing around a large, beautifully decorated tree. The names of the children up to sixteen years of age were secured from each family and at the party these names were called and the boys and girls were presented with the candy and a large apple by a "Santa Claus." The largest number of children receiving presents in one family was seven.

After this part of the program, a three-act play was staged by a local dramatic club. Music was furnished by the company orchestra. The party was largely attended and was a complete success. Everyone had a good time. The expense was borne by the company. Yes, let's have a Christmas Party!

—A. W. FREEMAN, *Superintendent.*

THE inspiration that comes of human contact can be obtained when the workers and their families and the officers of the company get together at the Christmas party. Short speeches can appropriately be made by various workers and officers, relating to experiences in the factory, and company policies.

If the speaking is carefully planned and seriously conducted it cannot fail to fill the workers with an enthusiasm unobtainable by any other means. Men can be influenced successfully only when their minds have caught the real spirit of the message the speaker is trying to get to them. When the speaker happens to be an official, delivering his speech at the Christmas party, the workers are more likely to be convinced of the sincerity of the company's policies as brought out by the speaker, because of the good-fellowship and cooperation engendered through the medium of the party. The Christmas party presents an ideal medium for getting across important messages from the company; messages that show the attitude of the management toward the worker and his problems. —N. BURD.

Gang Bonus in the Shop

ED IS RIGHT in feeling that the gang bonus will tend to "cut out the individuality" among the men. But wouldn't this be a good thing in the long run, and better for all concerned?

If it is arranged as Al seems to think it is, each man being paid an hourly rate, which varies with the value of the man, and the bonus to be paid to all, doesn't this still leave some incentive for individuality? And will it not have the added advantage of helping to make each man feel that instead of being the whole thing, he is, after all, only a part, and that the whole is justified, to a certain extent, in expecting some of his consideration? In other words, wouldn't this tend to promote a feeling of co-operation, which is one of the hardest traits to foster and one of the most valuable assets to any undertaking. —LLOYD E. ARMSTRONG.

Flat-Car Construction Work

at the Great Northern Shops

Steel underframes for 50-ft. flat cars are built by progressive assembly on a track accommodating seven cars

TO MEET the need for better car equipment and to fulfill a building program that includes the construction of various styles of steel freight cars, the Great Northern Railway Company has arranged its car shop at Superior, Wis. to accomodate a progressive system of construction. Cars are built in quantity lots according to the style desired, and the equipment is such that a change from one type of car to another can be handled at short notice.

As the shop was erected before the general adoption of straight-line construction, it is necessary to assemble cars on one track to a certain stage of completion and then transfer them to an adjacent track for final operations. This method works out satisfactorily, inasmuch as cars are built up to the point of decking before being transferred to the second track.

In building steel underframes for 50-ft. flat cars, all of the steel parts required, including the center and the sidesill web plates, are cut to size and have the required holes punched in them. These parts are then transferred to a platform where the top and bottom angles and the draft lugs are applied, constituting the first operation. After being assembled to this stage, the units are stored at one side of the assembly track, adjacent to the location where car building is started.

Seven cars are accommodated on the assembly track. They are shifted in unison at stipulated time intervals. At these seven stations the following operations are handled: (1) Assemble frame of car including side and center sills, body bolster and diaphragm, (2) Ream all holes for hand riveting, (3) Hand-rivet holes that cannot be done by riveting machines, (4) Assemble end sills, draft gears, and couplers, (5) Assemble center-sill cover plate and body-bolster cover plate, (6) Ream all holes for machine riveting, (7) Rivet complete, using portable riveting machines.

After the transfer of the cars to the second track, the operations include the assembling of air brakes, pin lifters, and all small brackets, and the application of decking. In this condition the cars are ready for painting and stenciling. Trucks are handled as a separate unit, and are delivered from an adjoining shop.

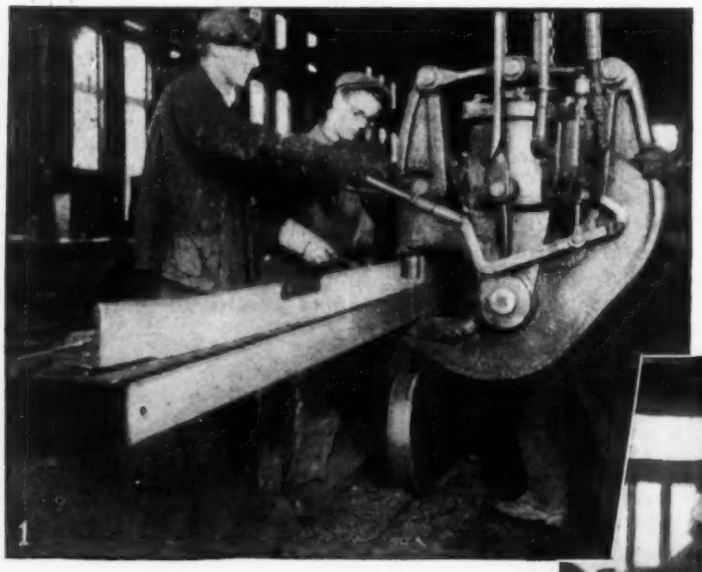


Fig. 1—A portable pneumatic riveter used for fabricating sub-assemblies. The view shows angle plates being assembled to a side sill. The work is supported on a platform car and the riveter is hung from an overhead hoist. Four men handle the operation; two manipulate the riveter, another places the rivets, and the fourth operates the portable rivet heater

Fig. 2—Stationary pneumatic riveting machines are used for the same class of work as Fig. 1. Here is shown a center sill in the process of assembly. The work is supported by an overhead hoist that travels on a runway. Heated rivets are placed in the box shown at the front of the operator at the left, where they are picked up easily for use

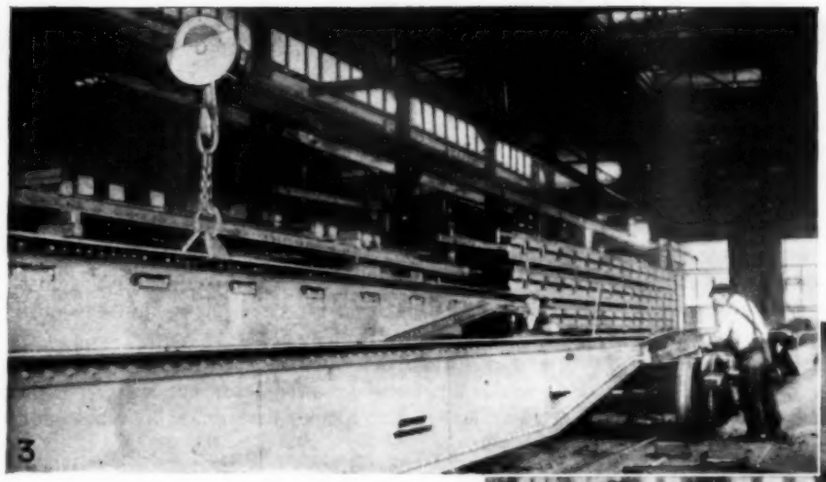


Fig. 3 — Starting construction of a 50-ft. flat car. The crane is shown lowering a center sill in place between two trucks. After center and side sills have been located and joined together, the car is moved to the next work station for the reaming of holes for hand-driven rivets. Seven cars are accommodated on this track, and are shifted in unison at stipulated intervals

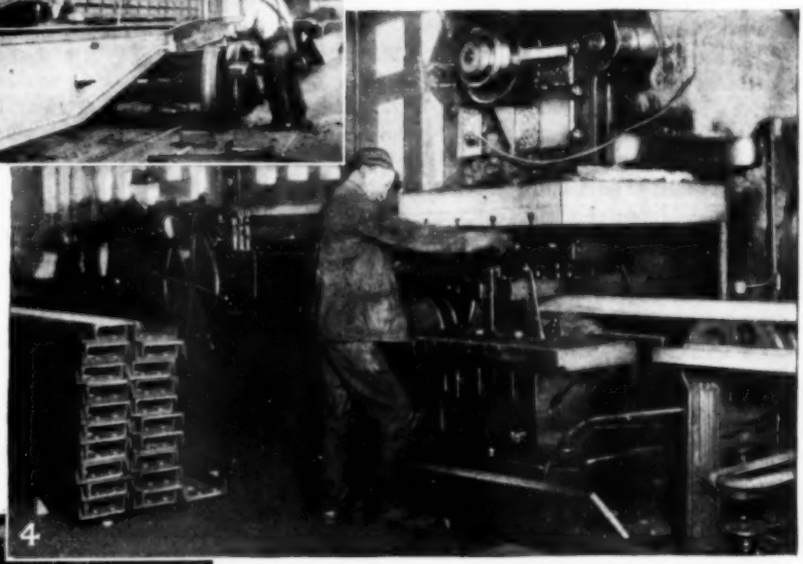


Fig. 4 — One of the punches used in connection with the piercing of holes in miscellaneous car parts. The section shown in the machine is an end-sill channel such as those shown at the left. The machine is run by two operators, one feeds the work and the other operates the machine. Parts are run through in quanity lots, so that multiple-punch sets-ups can be employed

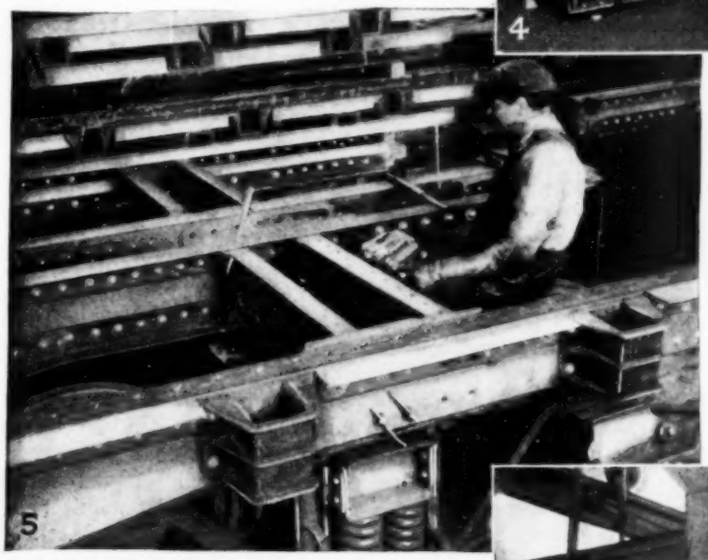


Fig. 5—Reaming at assembly is done with the aid of air motors. The operator is shown reaming a center sill and cross plate preparatory to riveting. Wedge-type make-up bolts are used in assembling the various units. These make-up bolts have rectangular slots at one end, into which a wedge is driven, making it unnecessary to remove the nut. Some of these bolts may be seen holding the side sill in place

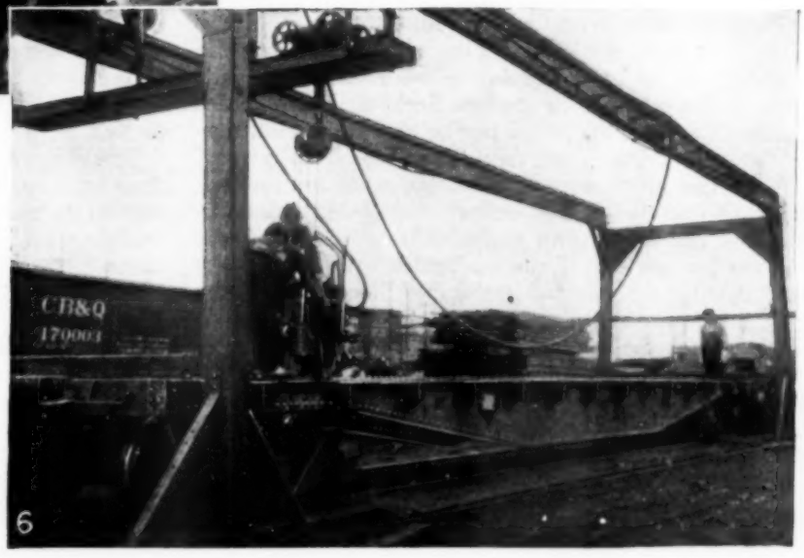


Fig. 6 — After hand riveting has been completed, and end sills, couplers, and cover plates have been assembled, the car progresses to an outdoor station, where all remaining riveting is done. A portable pneumatic riveter supported by an overhead traveling crane is used for the operation. From this location the car is transferred to an adjoining track, and is ready for painting and stenciling

Electricity Used in the Heat-Treatment of Metals

By A. N. Otis

Industrial Heating Engineering Department
General Electric Company

WHILE it is true that electricity is the most expensive fuel on a B.t.u. basis, it is also true that in many cases furnaces can be maintained at temperature and work done at a lower cost with electric heat than with combustible fuels, for heat alone. For example, the ordinary box-type furnace used in tool rooms is required to stand idle a large part of the time, but must be maintained at temperature and ready for use at all times. Comparatively little of the heat is actually used, by far the greater part being the losses.

The losses from electric furnaces are very small, due to efficient heat insulation, while the losses from fuel furnaces are relatively large due to the flue losses. An electric furnace 18 in. wide by 36 in. long will require 20,500 B.t.u. per hour to maintain its temperature at 1,600 deg. F. as against 104,000 B.t.u. for a gas furnace of the same size.

Carburizing furnaces are sometimes required to hold the charge constant for 20 or 30 hours or more, after reaching temperature, and the small losses of electric furnaces make them very economical for this service also. An electric furnace 3 ft. wide by 6 ft. long will require 51,000 B.t.u. per hour to maintain it at a temperature of 1,600 deg. F. while a similar gas furnace will require 240,000 B.t.u. Electrically-heated furnaces of the rotary hearth and pusher type are well adapted for carburizing on a large scale, and many of them are in daily use. The power consumed for heat-treating in these types of furnaces is about 200 kw.-hr. per ton, and for carburizing 400 to 600 kw.-hr. per ton, varying with the conditions.

Annealing Tool Steel

Electric furnaces are used extensively for annealing tool steel and alloy steel bar stock, for which careful annealing is essential. Accurate temperature control and uniform heat distribution in the furnace are necessary during the long holding cycle, and the material must be cooled slowly and uniformly throughout the furnace if the desired results are to be secured.

The tool steel stock is usually packed in boxes for annealing, in order to avoid decarburization, but for much of the other stock a slight decarburization is not objectionable, and the boxes can be dispensed with, saving the cost of boxes and the heat to heat them, as well as permitting much more efficient loading of the furnace, and consequently greater output and lower heat consumption per ton. With boxes, 370 to 400 kw.-hr. is required per net ton of stock annealed. Without boxes about 300 kw.-hr. per ton is required, depending on the cycle and size of furnace. The holding capacity is doubled when the boxes are omitted.

An oustanding example of the overall economy of electric furnaces in certain cases, is in the annealing of sheet steel laminations for generators and transformers. Fuel-fired furnaces require the use of boxes, but with electric furnaces they can be dispensed with, thus making the large savings possible. The cost of electricity for heating is less than the cost of oil, and in addition the cost of boxes is saved, the space to store them, and the output per furnace is more than doubled.

In one department having four furnaces of 3½-ton capacity, and one furnace of 10-ton capacity, 16,000 sq.ft. of floor space was saved, and made available for other purposes.

The cost per 100 lb. annealed was found to be:

Electric Furnace		Oil Furnace	
10.8 kw.-hr. at 1¼c. =	13.5 c.	2.89 gal. @ 5.57c. =	16.5c.
Base plates	0.86	Boxes	11.4
	14.36c.		27.9c.

Taking into account the increased output of the electric furnaces, the savings are sufficient to pay the installation cost in less than a year. The power required for this operation is about 200 kw.-hr. per ton.

A further advantage of these furnaces is the ability to control the atmosphere. It has been found that when this material is annealed in atmospheres of certain gases, a marked improvement in the magnetic qualities is secured. It would be impossible to maintain these atmospheres in fuel-fired furnaces without the use of boxes.

Brass for deep drawing requires a careful final anneal, and electric furnaces are used for this purpose, with excellent results. The low temperature of the source of heat, its wide and uniform distribution in the chamber, combined with automatic control of temperature, make ideal heating conditions for this product.

The furnaces are about 6 ft. wide by 30 ft. long, and take charges of 6,000 to 10,000 lb. The material is usually in the form of long thin strips, 4 to 12 in. wide. These are wound into coils, and pulled into the furnace on large pans. Slightly more than one hour is required for the metal to reach the annealing temperature of about 1,000 deg. F. The power consumed is about 80 kw.-hr. per ton, also varying somewhat with the conditions.

Electric furnaces are particularly well adapted for applying vitreous enamel coatings. The advantages lie in the clean atmosphere and in the ability to properly distribute the heating units and control the temperature so that all the surface is uniformly burned.

The resistor units are mounted openly in the heating chamber, making it possible to heat the ware more rapidly than with the muffle-type, fuel-fired furnaces generally used. The furnaces are reliable, and low in maintenance cost. As an example one of these furnaces has been in operation 32 months at 1,550 deg. F. without shutdown.

These furnaces are usually of the box type, and are equipped with motor-operated speed forks to enable rapid handling of the ware in and out of the furnace. They are also built in the continuous conveyor type. In a typical box furnace, 4 ft. wide by 12 ft. long, used for enamelling the linings of domestic refrigerators, the output per kw.-hr. is 8.15 lb., and 3.25 sq.ft. of single-coat ware.

Abstract of a paper presented at the Western Metal Congress, Jan. 14-18, at Los Angeles.

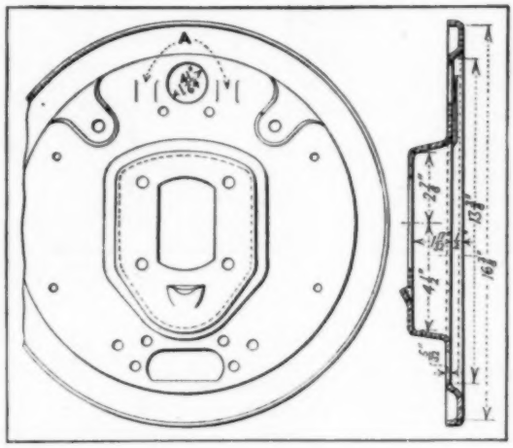


Fig. 1—A sheet-metal brake shield

Reverse Drawing an Automobile Brake Shield

Sequence of operations, and constructional features of the dies used to make the part

IN THE press working of sheet metal, problems frequently arise where the only, or at least the best, solution is the reverse draw. The reverse draw is useful (1) wherever the shape is so unsymmetrical that the metal will not stand the draw, (2) where the area of the portion to be drawn is so small in proportion to the whole that the metal ruptures before the blank slides between the die-face and blank holder, and (3) where the sides of the part to be drawn are not vertical and tend to wrinkle excessively. It is also used on cylindrical cups where a reverse bend and flange are required, and in such metals as copper and steel a greater reduction in diameter on each draw can be obtained without wrinkles. The object of the first draw, or the operation preceding the reverse draw, is to gather a sufficient quantity of material for the reverse by using a symmetrical shape having easy flow lines, one that will not wrinkle excessively. The application of this principle is qualified with so many exceptions as to size of blank, depth of draw, and thickness of material, that its use becomes very much a matter of experience. A concrete example of its use is illustrated in drawing the hub section of the brake shield shown in Fig. 1, at the plant of The Reo Motor Car Company, Lansing, Mich. This hub is unsymmetrical, and located at the center of a steel blank $\frac{5}{32}$x18x18 in. It was the judgment of the tool-designing department that the press would punch out the bottom of the hub before the blank would slide, and a reverse draw was therefore decided upon. The hub could have been drawn by several operations with annealing between, but the die cost would have been excessive, and the different operations would probably have left many fold ridges on the finished part. In the present case a spherical segment is the best shape to use, for while it is a very difficult shape to draw under ordinary circumstances, it has the flattest flow lines, and is adjustable, in that any part, or the whole, may be used by adjusting the press ram to draw the desired depth. The larger the radius of the diameter, and the smaller the radius of the depth, the easier the cup will draw. It is essential that its diameter be greater than that of the part to be drawn in the next operation, and the depth must be such as to furnish the necessary material for the vertical walls plus the flat area. The hub section is $7\frac{1}{8}$x $5\frac{3}{8}$ in. diameter by $1\frac{17}{32}$ in. deep, having a total area of 62 sq.in. or 30 more

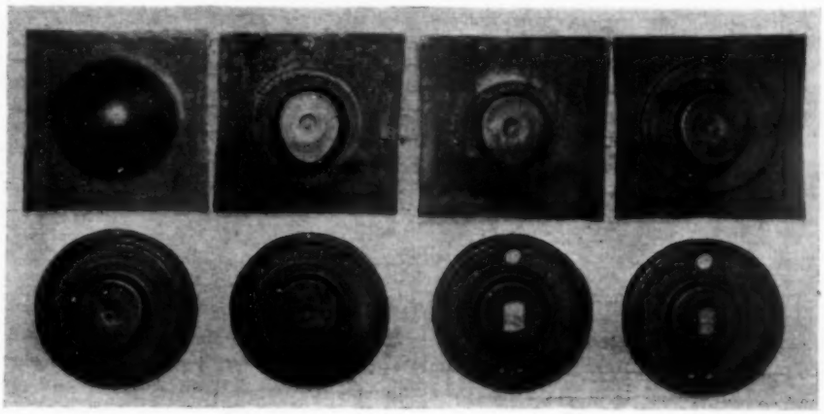


Fig. 2—Evolution of a brake shield showing the various operations performed. The blank is sheared to 18-in. squares, and is trimmed after the central portion and flange have been drawn to shape

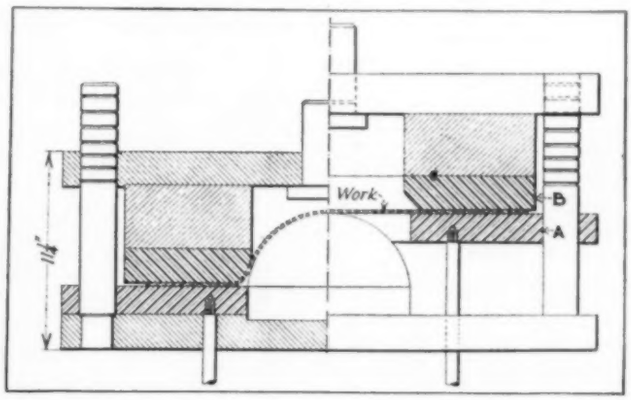


Fig. 3—The first drawing operation forms a spherical projection in the blank, the area of which is somewhat greater than the area of the finished hob. The purpose of this procedure is to permit all the stretch to be made in one draw. A two-pin die shoe is used

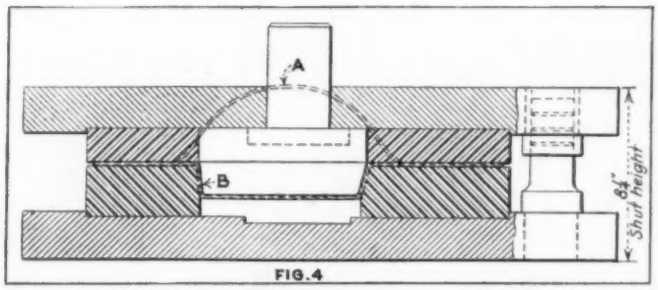


FIG. 4

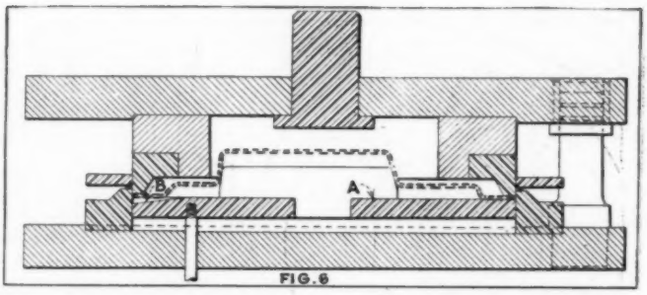


FIG. 6

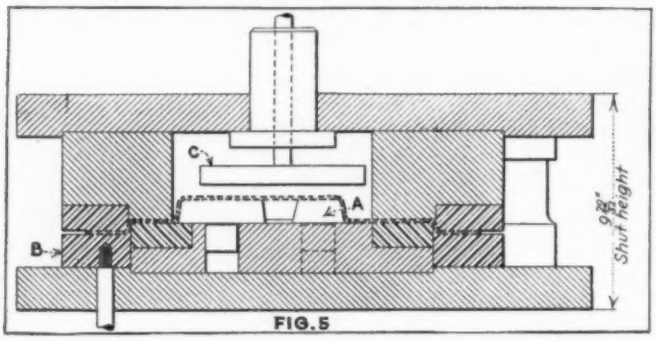


FIG. 5

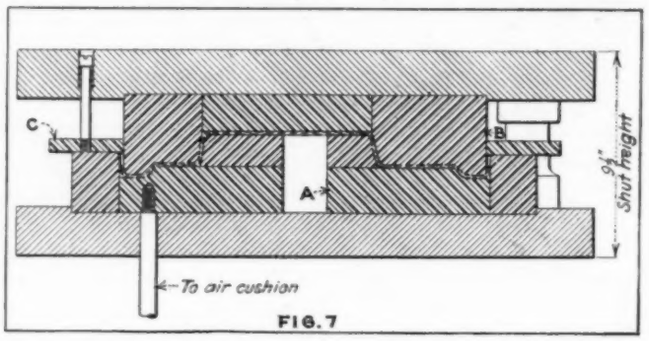


FIG. 7

Fig. 4—After the reverse draw is made, the shield is placed with the spherical projection up. When the forming punch descends, the projection is reversed. The excess metal drawn in the first die flows back into the flange. Fig. 5—The outer flange is formed in this die, the shield being located from the hub section. The two countersunk impressions shown in Fig. 1 are made also. A knockout ejects the work, should it stick to the drawing ring. Fig. 6—Following the drawing operations, the flange of the shield is trimmed to size. Means are provided for ejecting the piece from the die. Location is taken from a plug attached to the central pressure plate. Fig. 7—The final forming operation turns up the edge of the flange. The piece is located over a formed block, which is mounted on a spring-pressure pad. As the punch descends, the pad is forced downward, and the flange is formed around the drawing ring and is ejected as the punch rises

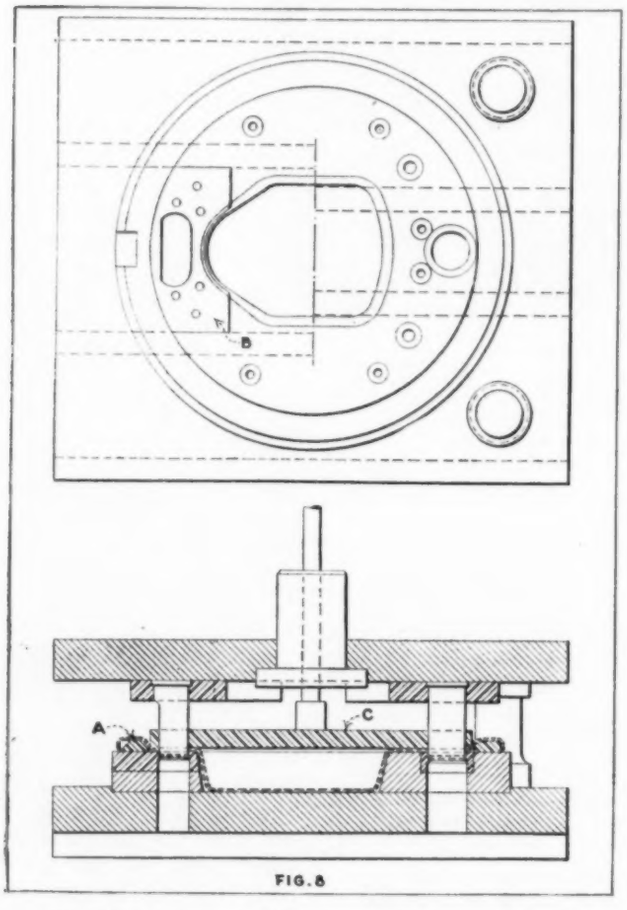


FIG. 8

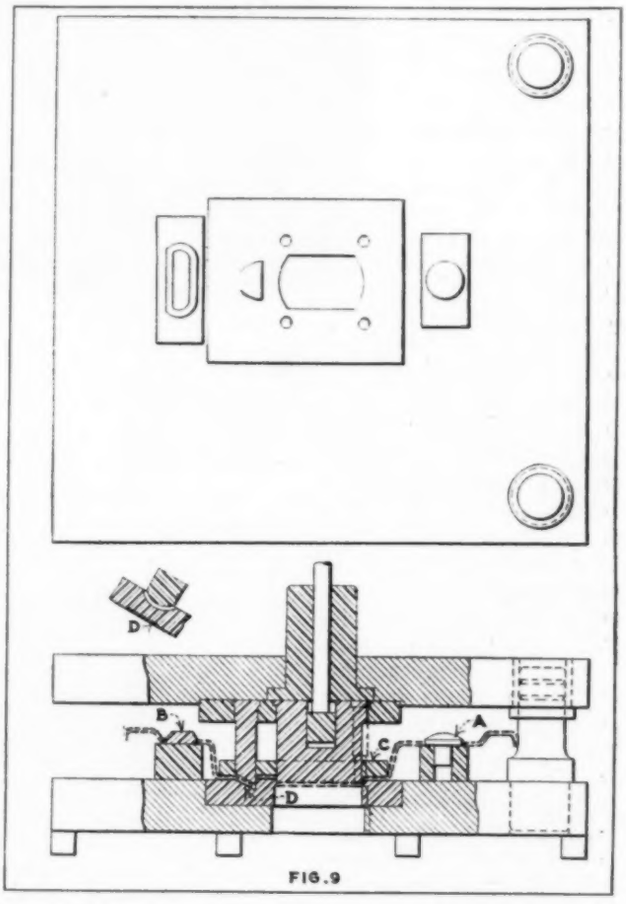


FIG. 9

Fig. 8—Location of the work for piercing the two large holes and the fourteen small holes is made from the outside ring A. A pressure plate seaats the work. Fig. 9—This die pierces the large center hole. Two locating plugs A and B align the work from the holes pierced previously. A stripper ejects the work

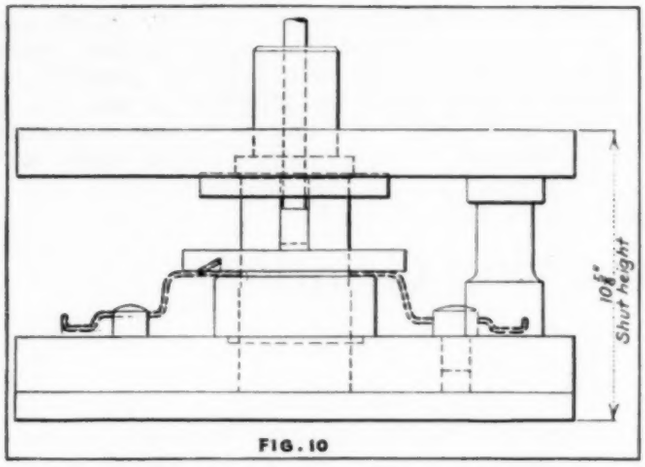


FIG. 10

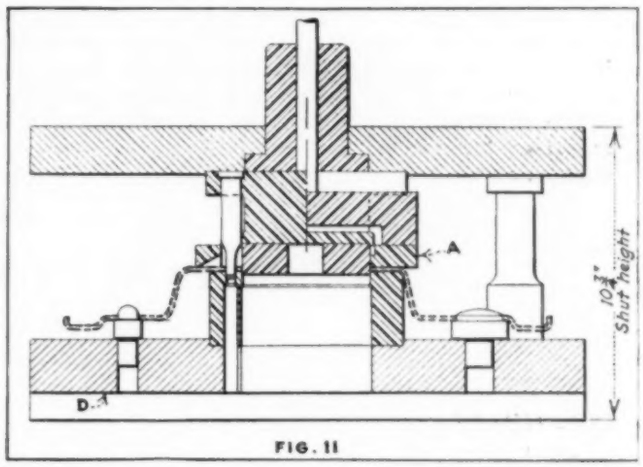


FIG. 11

Fig. 10—When the large hole is pierced, strains cause it to spring out of shape, thus necessitating a shaving operation, which is handled in the die shown. Alignment of the work is from two locating plugs, and the section of the work to be shaved rests on a die block. Fig. 11—Piercing of the radial holes in the formed hub section of the shield is done in a plain-type piercing die equipped with a spring-pressure pad to seat the work properly against the die block. Alignment of the shield is by two locating plugs as in Fig. 10. A clearance slot is cut in the die shoe to permit the removal of slugs that are blanked from the several holes

than its flat area. A segment of a 9-in. sphere 3⅛ in. deep has a total area of 85 sq.in., or 32 more than a flat area of equal diameter. Its diameter will be approximately 8½ in., which is suitable for the purpose.

Sample parts showing different operations are shown in Fig. 2. An examination of the first operation shows that the edges of the blank are drawn in very little, even with the flat flow lines, which fact confirms the judgment of the tool-designer that the hub would not draw. It also shows a very smooth surface, seemingly contradicting the statement that it is difficult to draw a spherical segment without wrinkles. The answer in this case is that nearly all of the metal in it has been drawn from the thickness of the blank, as the edges again testify.

All of the operations are performed on a single-acting press equipped with pneumatic devices for the stripping, and pressure plates. The dies are of similar construction, as regards the shoes, guide-post arrangement, and the method of holding the punch or upper die. They differ, of course, in the application of strippers, knockout, and pressure pads.

The following sequence is observed: (1) Shear to size, (2) first draw, (3) reverse draw, (4) size, or restrike, (5) form rim offset, (6) trim edge, (7) form flange, (8) pierce flange, (9) pierce center hole, and (10) shave center hole.

Construction details of the die for the first operation are shown in Fig. 3, which is drawn in section to show it in both the open and closed positions. The blank is held firmly between the pressure pad *A* and the die *B*, as is customary, to prevent wrinkling. This operation requires neither knockout nor stripper.

The reverse draw is shown clearly in Fig. 4. The lightly dotted line *A* represents the spherical segment drawn in the first operation, and the heavy dotted line *B* shows its outline after being reversed, or turned inside out as it were. Inasmuch as there is a slight surplus of material the operation becomes one of compression rather than of drawing. There is no inherent advantage in reversing a draw save in the convenience of holding the blank for the next operation, and in some cases it minimizes the fold ridges, which are always detrimental to the appearance, and sometimes to the use, of the part. In the first operation the metal flowed into the cup in a large radius, but it left a fold ridge that shows up in the finished part despite the numerous flattening operations.

The next operation is to size, or restrike, the part in an open die, similar in shape to that shown in Fig. 4. This tends to sharpen the corners, flatten the fold ridge, and remove any warp that may be present.

The flange of the shield is formed in the die shown in Fig. 5. The hub formed in the previous operations registers on three locating pins *A*, and the pressure plate *B* holds the flange during the operation to insure uniform drawing. It also acts as a stripper on the upward stroke, and the knockout *C* functions if the part should stick in the upper die plate. The two countersunk sections shown in the upper half of Fig. 1 are also impressed in this operation.

In the next operation the outer edge of the shield is trimmed. The die for this purpose is shown in Fig. 6. The blank is located from the hub section, and the pressure pad *A* keeps the shield flat. The "pick off" *B* affords an opportunity to pry it off, should it stick to the center block.

The shield is given a final sizing or "striking," and the flange turned up in the die shown in Fig. 7. As in the other dies it is held by the pressure pad *A*, against the punch *B*, the stripper *C* removes it from the punch. The countersunk surfaces *A*, and *B*, Fig. 1, are also "struck" at this time.

For piercing the two large, and fourteen small holes the die shown in Fig. 8, is used. The shield locates from its flange over the ring *A*. For the group of one large and the six smallest holes, a hardened plate *B* is inserted in the machine-steel die block. Individual bushings are inserted for the remainder of the holes. The stripper *C* clears the shield from the punches.

The center hole is pierced by the die shown in its closed position, in Fig. 9. The shield locates from the buttons *A* and *B*, which fit in the holes punched at the previous operation. The pressure plate *C* insures the proper seating of the shield before the hole is pierced. The ear at *D* is also cut and formed at this time. A cross-section of *D* is shown.

To relieve the strain on the die, and to avoid warping

the blank, especially where steel is used, a considerable clearance is left between the sides of the punch and the die. The result is a taper hole with its upper side of the same size as the punch, and its under side the same as that of the die. By blanking the original hole slightly undersize, turning the blank and "shaving" it from the other side a straight sided, accurate hole is secured. The die for this purpose is shown in Fig. 10. As the final operation the four small holes around the large central one are punched. As in the previous operations the shield is seated firmly by the spring pressure pad *A*, Fig. 11. It will be noted that the die shoe is slotted at *D* in line with the holes to afford removal of the small punchings.

Abrasives in Production Grinding

By B. H. Work

Assistant, Sales Engineering Department
The Carborundum Company

STANDARDIZATION work on shapes and dimensions of grinding wheels has directed attention to standardization along lines of simplified bonds and grade symbols with the idea of simplifying markings. This will lead ultimately to the adoption of standard specifications that will enable the buyer to purchase from various sources wheels which will give identical performance, and bring about a situation analogous to that existing in the steel industry with respect to the S.A.E. specifications.

All abrasive wheels are composed of two base materials, abrasive material and bond material. Further variables lie in process methods. These three factors, abrasive, bond, and process, create a still further variable —wheel structure.

There are two distinct abrasive materials commonly used in abrasive wheels: (1) Fused aluminum oxide, Al_2O_3; and (2) silicon carbide, SiO. Each abrasive grit or grain of aluminous abrasive (the term "grit" or "grain" used here is descriptive of abrasive material graded to standard marketable sizes) is composed of a number of individual crystals held together by a matrix. The matrix can be varied to produce a binder of greater or lesser strength which will govern the toughness of each individual grit or grain.

In the production of abrasive materials of extremely high purity, additions to the furnace mix, and proper adjustment of fusing temperatures and cooling rates will produce varying lines of fracture. The above statements apply particularly to aluminum oxide.

In addition to these properties, controlled chiefly in the furnace practice or manipulation, there are other points of control necessary in the crushing and grading which have a definite bearing on the action of the fabricated wheel: (1) Grit shape; and (2) grit size (uniformity). Uniformity of size and shape of grit must be controlled in the production of uniform wheel structures.

The bond or bonding material is the second element involved in the manufacture of abrasive wheels. Five distinct types of bonding materials are used: Clays (vitrified); rubber (vulcanite), shellac (elastic), Bakelite or synthetic resin, silicate (sodium silicate). Each of these bonding materials imparts definite characteristics to the abrasive wheel in which it is used, and each has a rather definite field of application, although these fields overlap in many instances.

Further, variation in processes can be used in fabricating wheels with any one of these bonds. Consider for a moment the possibilities in vitrified or clay bonds, plus process variations. There are a number of clays or clay mixtures, satisfactory from the ceramic engineer's viewpoint, that can be used to produce variations in bonding characteristics, and there are two distinct processes well developed which are in common use, namely the puddled process, and the pressed process.

That the work of simplification can be carried further, the wheel manufacturer's individual problem is to develop from an immense field of possibilities, a wheel of maximum flexibility which will cover the widest field of application. The wheel manufacturer's group problem presents only one workable plan for simplification, a common scale of grits and grades. To accomplish this, co-operative work must be carried on so that the various makes of product can be drawn into true relation with respect to the identifying symbols and their relative wheel actions. This problem is complicated by the fact that the physical tests that can be made on the wheel, up to the present, bear no direct or constant relation to the action of the wheel in use.

The consumer's or user's problem is to standardize equipment and operating conditions so that one type or grit and grade of abrasive product can be used efficiently on a greater variety of operations.

The third phase of this problem involves the machine builder. Since grinding wheel action and the results which the user can obtain are dependent on certain points of machine design, the machine builder must provide a range of work- or wheel-speeds so that the operator can compensate for conditions encountered.

One important variable which has not been mentioned is the material to be ground. Little can be done to simplify the abrasive requirements in this field, for special physical characteristics of metals either ferrous or nonferrous require special abrasive treatment. Further complications are being brought about by the fact that new grinding equipment, involving new principles and methods of abrasive application, is constantly being placed on the market.

Where does all this lead, and on what grounds can we urge concerted effort and understanding? In our own organization, we have a number of highly organized functions interested in almost opposed activities. The salesman is striving to meet all the demands of the consuming trade with suitable products. The ceramic and research departments are endeavoring to standardize existing processes and products, and to develop new and better processes to meet those demands. The sales-engineering department is working to apply the products correctly; the manufacturing department is working to meet all the demands of the other departments and also to produce cheaply and to quality standards. The problem of reconciling all these activities is of the same order as that of reconciling the diverse tendencies we have outlined in the outside field.

Abstract of paper presented before the production section of the S.A.E. at the annual meeting, Jan. 15-18, in Detroit.

Building Bus Engines in the Lancia Shops

By J. A. Lucas

Methods and fixtures used for machining the cylinder heads of a 100-horsepower bus engine of unusual design

METHODS and fixtures, used for machining the cylinder block of this 100-hp., slow-speed bus engine, have been described in a previous article. This present article takes up similar considerations covering the cylinder head. The characteristics of the head casting are similar to those holding for the cylinder block as to mixture and as to hardness, which is allowed to vary from 196 to 228 Brinell.

The first operation is to face the surfaces on a Naxos milling machine, the head being located in the milling fixture by three buttons that touch the water-jacket walls. After rough milling on both sides, the combustion chambers are machined, as in Fig. 15, and several other holes are drilled and reamed, the small bushings in the fixture showing where the long, through studs go to the cylinder block.

The fixture is located by means of a plug with a tapered end that centers from one of the two middle cylinders, numbers 3 or 4, as this method equalizes any casting variation between the different cylinder bores. After the first three combustion chambers have been machined, another locating plug, that fits both the fixture and the finished chamber, re-positions the fixture to machine the other three chambers. Finishing of the combustion chambers is done in these two operations, because it is much easier to make the fixture for three cylinders than for six on account of their close spacing. The combustion chambers are finished with the ball-shaped cutter shown in place in Fig. 15. The method of holding the fixture against the sides of the head and of clamping it by the hook bolts is also shown. Cross bars at each end make it easy to handle the fixture from one head to the next.

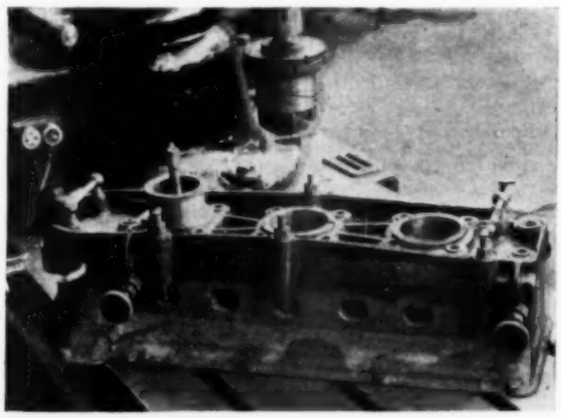
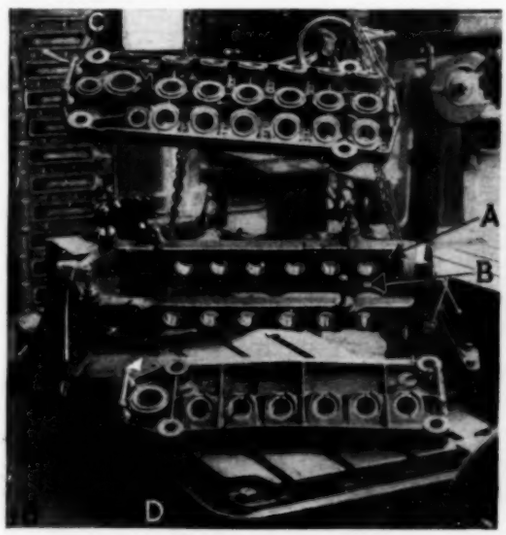


Fig. 15—The fixture for boring the combustion chambers is first located by a plug in bores 3 or 4. It is shifted after three chambers have been machined and is relocated for the other three

An unusual boring fixture is shown in Figs. 16 and 17. The body or frame consisting of an open box, *A*, Fig. 16, mounted on trunnions at each

The second of a series of articles. The third will appear in an early issue.



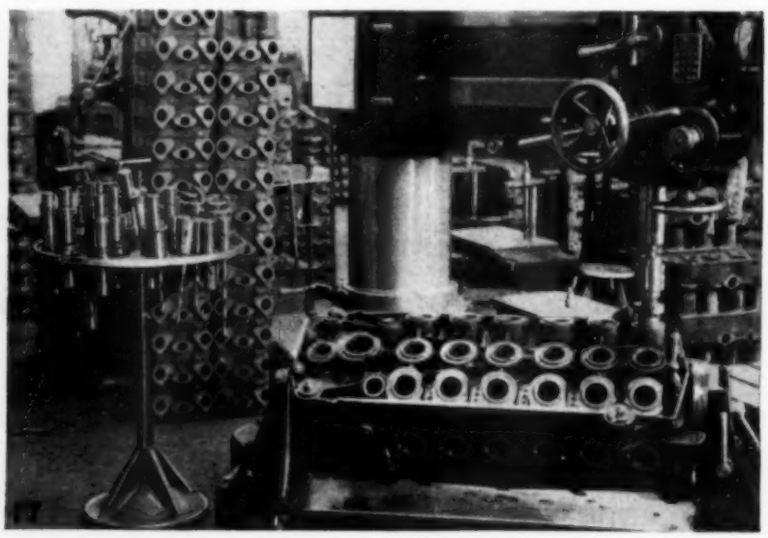


Fig. 16—Trunnion fixture that is used for drilling. The cylinder head fits into the body of the fixture and the bushing plates are used on the top and bottom. The top plate carries three rows of bushings at varying angles. Fig. 17—Fixture loaded and one of the angular holes being bored under a radial drill press. All the tools needed for this operation are shown in the special stand at the left. Full instructions as to speeds, feeds, and tools are in the glass-covered chart on the head of the machine doing the operation

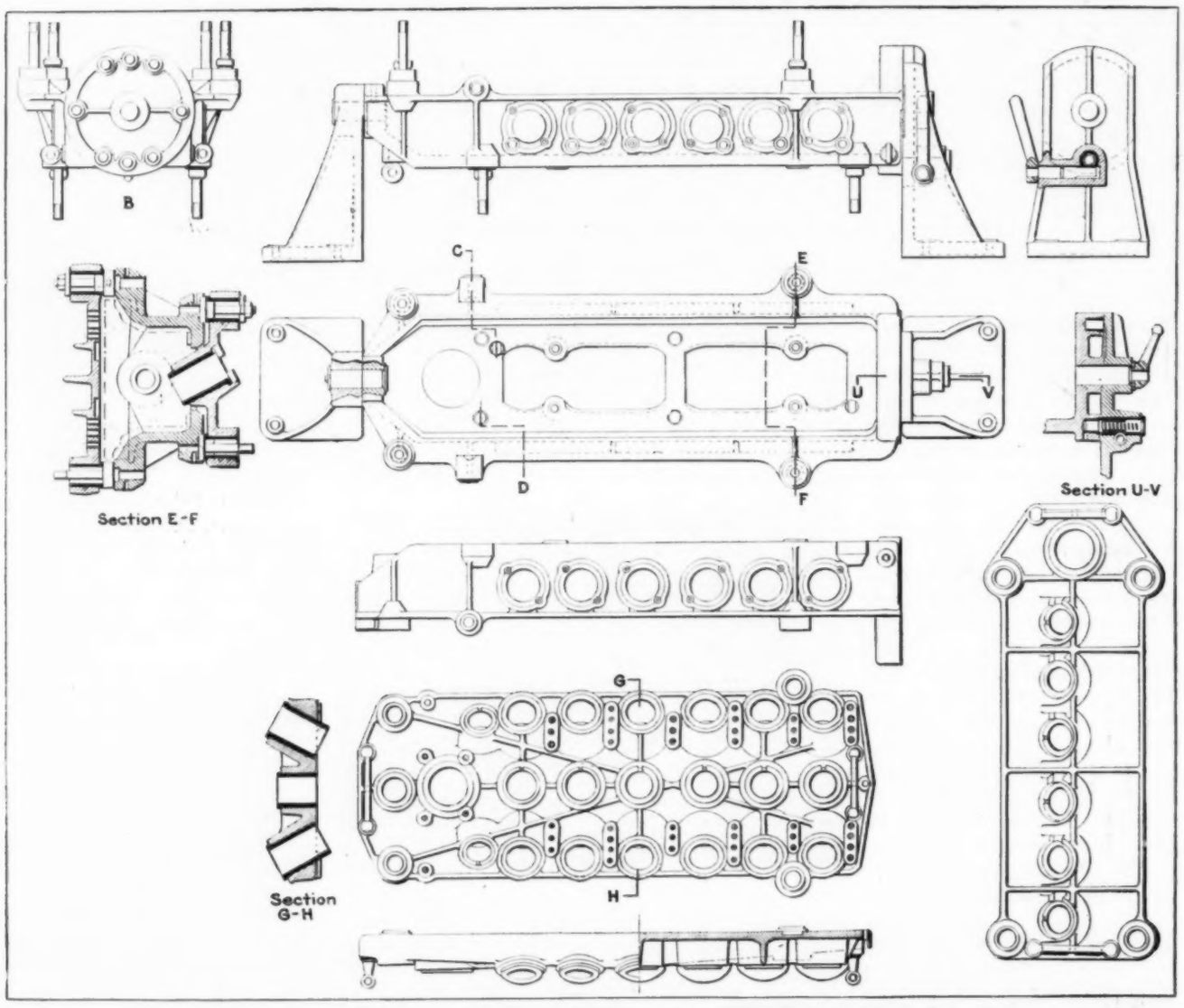


Fig. 18—Construction details of the trunnion fixture

end. This box receives the cylinder head, the narrow face resting on three hardened-steel buttons, as at *B*. With the cylinder head in place, the cover *C* is lowered over the four studs and is fastened in position. Plate *D* is then bolted on the side of the fixture, as in Fig. 17, and work can be started.

With the bushing plates in position, the valve guide holes, and all other openings, are bored, the cylinder head being indexed into three positions to machine the valve guides at an angle on each side and the spark plug holes in the center. While the fixture is in the central position, the holes for the camshaft supports are drilled, and the manifold seats are then faced on each side through the side openings.

The fixture is next turned over in its trunnions and the valve seats are faced through the holes shown in sec-

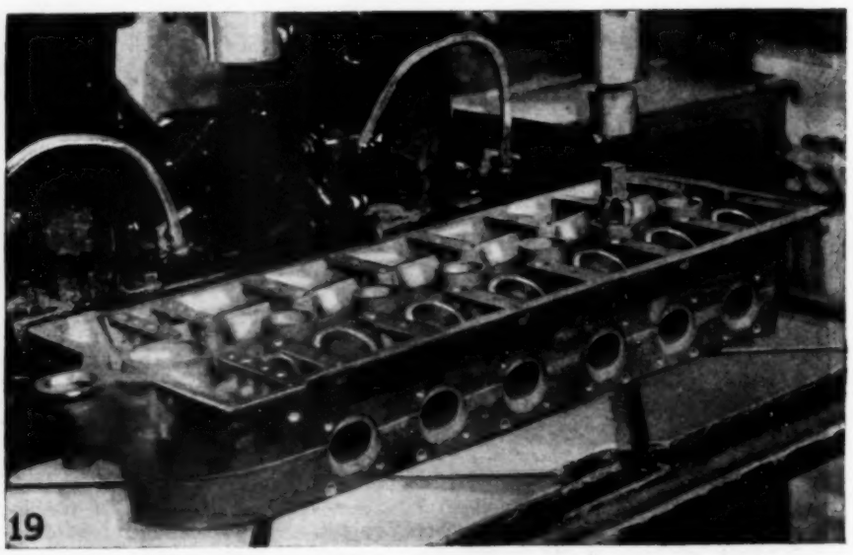


Fig. 19—Boring the spark plug recesses and tapping for spark plugs. This view shows the valve guides at an angle

tion *B*, as referred to in Fig. 16. Only six of the twelve bushings are provided, because there would be interference, owing to the angle of the valve on the other side of the bushing plate. Therefore, after machining the seats on one side, the fixture *D* is reversed on the four locating studs, and the other six valve seats are machined.

All tools required for this operation are held in a special tool-holding table convenient to the operator, as shown at the left in Fig. 17. Each tool has a number on the shank that designates both the tool and the operation. A chart fastened to the head of the machine, and framed under glass, shows just what each tool is for and gives all necessary information concerning it, such as speeds, and time required for the operation. In Fig. 18, certain of the construction details of this fixture are shown.

Spark plug recesses are bored and tapped as in Fig. 19, this view also showing the machined manifold openings on the sides, the general appearance of the head,

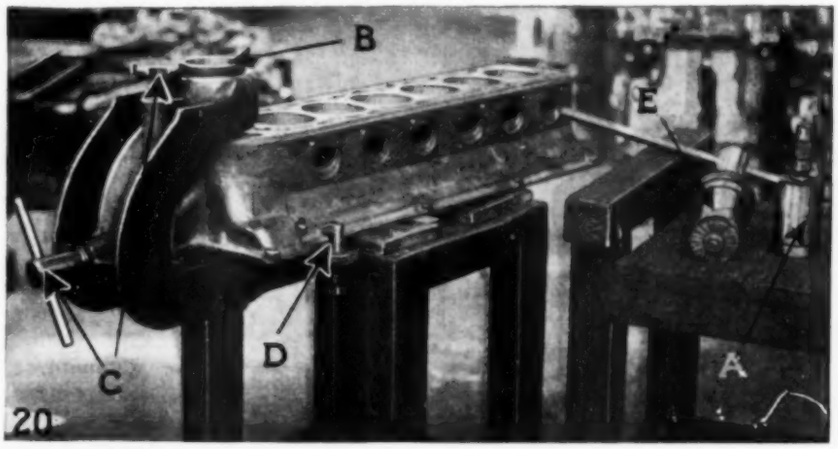


Fig. 20—Fixture for facing the bearing seats for the vertical shaft driving the camshafts. A bushing on the bottom similar to that on top insures the upper and lower bearings being in line

and the operations performed on it. After this operation comes the hydraulic testing to three atmospheres, and the final milling at the top and bottom. About 0.020 in. is left on each side for finishing.

The next step includes several hand operations, and the head is then ready for facing the seats for the vertical shaft bearing, this shaft being the one referred to in the previous article as transmitting power upwards to the two camshafts on the head. The seats are faced by hand in the fixture shown in Fig. 20, the head being located by using the plug *A* in the bushing *B*. The fixture is then clamped by the two screws *C* and by the hook bolts, as at *D*. Fig. 21 illustrates details of this fixture.

When the camshaft guides have been bolted into place, the fixture, shown in Fig. 22, is placed over the upper surface of the head and used to guide the reamers for finishing the camshaft bearings in place. The first reamer to be used is shown at *A* in Fig. 23. A suitable loose bushing is fitted into the bored hole just ahead of the hole to be reamed, to act as a guide for the reamer pilot. By moving this bushing from one bearing to the next, the reamer is guided in each, being used half way in each direction. Final line reaming is done without the fixture, as in Fig. 23 below.

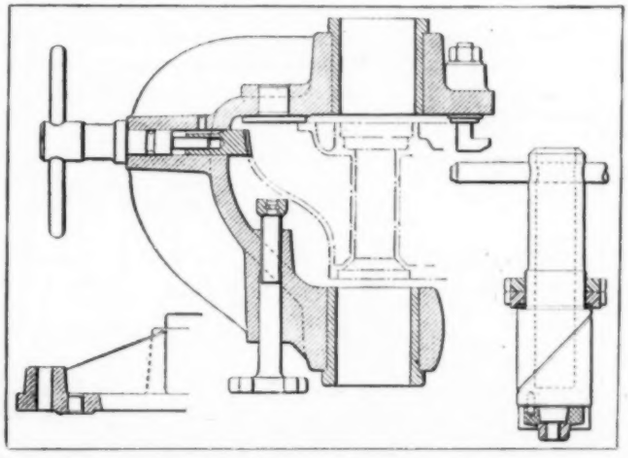


Fig. 21—Details of the seating fixture shown in Fig. 6

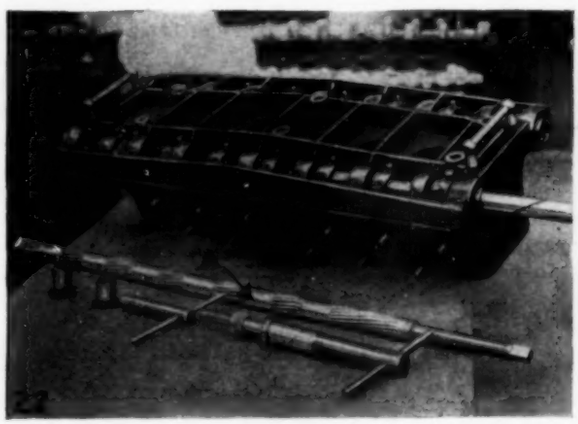


Fig. 22—First reaming of the camshaft bearings on each side, using an auxiliary bushing for the pilot on the front end of the reamer.

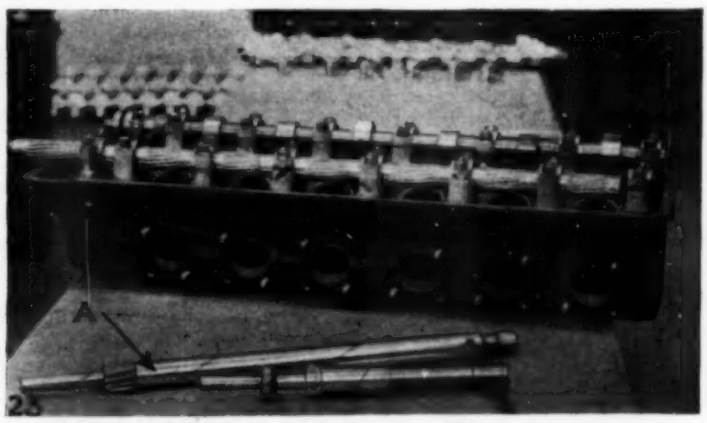


Fig. 23—Line reaming the camshaft bearing. The fixture is removed after the first reaming, and the multiple reamer used in all of the bearings. One camshaft is shown in place

IDEAS · FROM · PRACTICAL · MEN

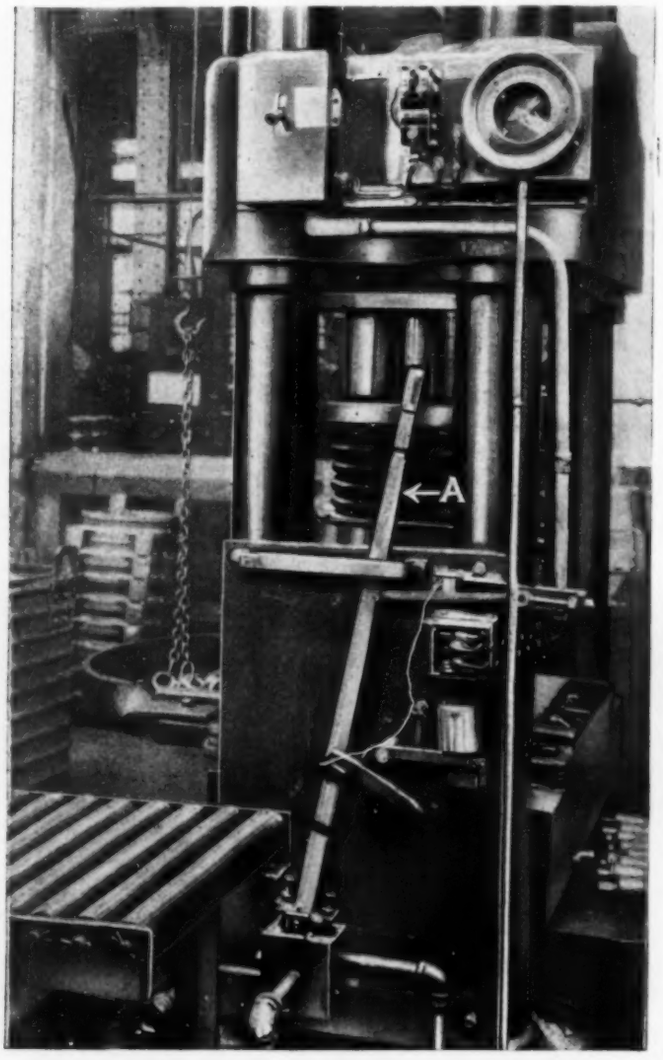
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from minimum of five dollars upwards, depending upon their merit.

Solenoid Applied to a Hydraulic Press

By R. S. Gilcrest

The illustration shows the use of a solenoid on a hydraulic press in the River Works of the General Electric Company. The solenoid is arranged with a weight hung on the plunger, and is connected, through a pressure governor with a 4,500-lb. scale, so that when the current is put on the solenoid and the pressure is down, the solenoid lifts the weight and holds it up.

When the operator puts work in the press, he pulls the lever *A* toward him, and the pawl shown just below the weighted plunger of the solenoid, is pulled into a notch in the ratchet sector on the lever by a spring to be seen at the left of the solenoid weight. As the press closes and the pressure builds up, the pointer rises on the scale of the governor until it reaches a predetermined maximum setting where it makes contact, tripping the small contactor on the left of the governor panel and allowing the solenoid plunger to drop, knocking the pawl out of the ratchet and permitting the lever to be drawn to the right by the spring just above the solenoid. This action closes the supply valve and prevents the pressure from rising beyond the predetermined amount. The cycle is repeated at each operation of the press.

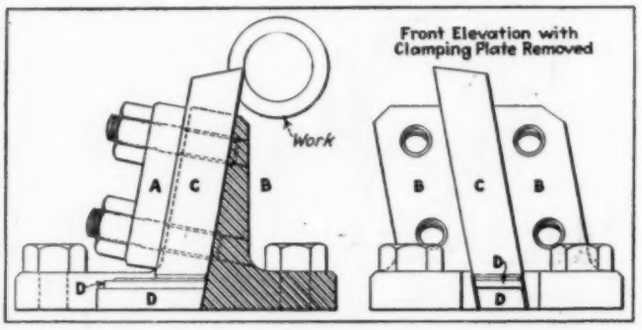


Solenoid for operating a shut-off valve

A Rigid Toolholder for Roughing

By John José
Cornwall, England

The tendency in lathe work is to use the older machines for roughing and the more accurate newer ones for finishing. It is usually found, however, that the old lathes will not stand up under a heavy cut. Either the toolpost will not carry a large enough tool, or the compound rest is too weak.



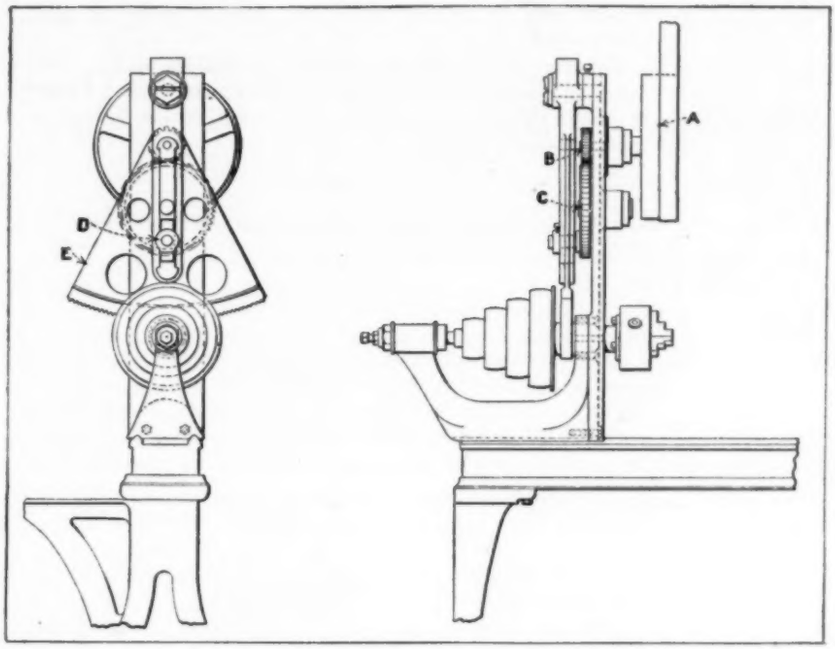
A rigid toolholder for old lathes

The toolpost illustrated remedies the above conditions and allows as heavy a cut to be taken as the crossslide will stand. The holder consists of a mild steel block *B* having a groove cut at an angle of 12 deg. for both rake and clearance. A square or rectangular tool bit *C* is clamped by the plate *A*. As the bits wear, filler pieces *D* are added, the whole making an exceedingly rigid unit, that will save time on roughing operations.

An Air-Cock Grinder

By James E. Kearsley

An attachment than can be applied to a speed lathe to produce an oscillating movement, is shown in the illustration. This machine has been in operation several



Grinding air cocks in a speed lathe by using an oscillating quadrant

years in the grinding and lapping of air and gas cocks.

The drive is through the pulley *A* and the pinion *B* to the gear *C*, which by means of a crosshead *D* and guide oscillates the quadrant *E*, which in turn revolves the lathe spindle one and one-half revolutions ahead and reverse.

Standard gears are used, and the quadrant and support are of cast iron. The fixture is fastened to the lathe by four screws.

Using Four Radials Simultaneously—*Discussion*

By Homer Marian

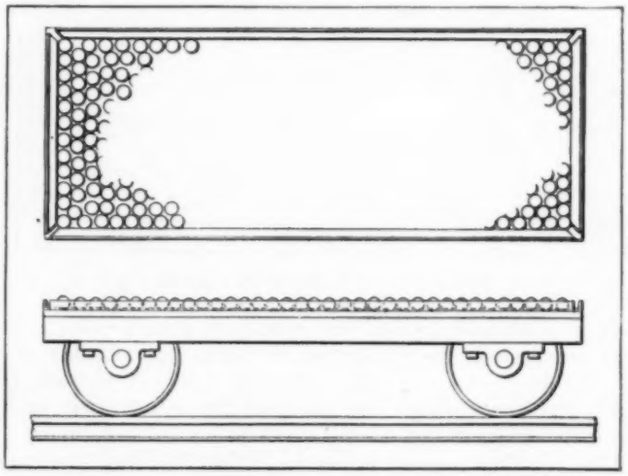
In a recent article on the above subject by Chester H. Franklin, Vol. 70, p. 181, of *American Machinist*, the illustration shows four radial drill presses, of which two are portable, drilling a boiler plate mounted on twin cars. Four men are shown, one at each radial, which causes me to wonder whether they were used regularly, or were just posing for the occasion.

It is well established in shop management that two men can do a job similar to that shown in less time than three, and three men quicker than four. This of course refers to the total time, including that necessary for each man to quit one job and rig up on the other. If one man can run more than one drill press, either at the same time, or at different times on the same sheet, a saving in cost will result. But if four men are used simultaneously, as shown in the illustration accompanying the article, one man with a single press will beat their combined time.

In the last paragraph Mr. Franklin says, "It is difficult to imagine a more flexible combination than this." If I analyze the situation correctly, it is still necessary to shift the plate to clear the supporting T-rails on the two cars, for even if it were allowable to drill into them, a drill striking one edge would not only break itself, but might cause some of the others to break. While this shift is being made for one man the other three are losing time, and the move to accommodate one man may inconvenience another.

Criticism of the other man's method is not justifiable unless it is constructive, and I show in the illustration an arrangement that makes it unnecessary to shift the plate, unless it is larger than the combined cars.

The change required is simple, the T-rails are removed and 1¼-in. angle-iron is fastened all around the edge of the car. The space between the angle-irons is then nearly filled with cast-iron balls about 2 in. diameter. This will give a rigid support around the hole being drilled, and it will be unnecessary to move the plate, as a ball will move if the drill touches it. Such an arrangement of balls does not prevent the car being used for any other purpose, as it is in effect a flat surface.



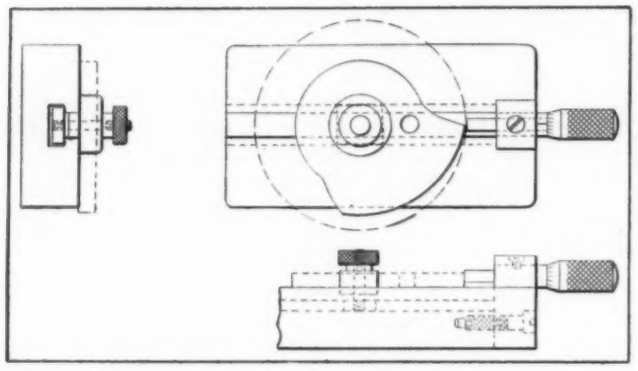
Cast-iron balls on a plate-drilling car to obviate moving the plate while drilling

Micrometer for Measuring Height of Cam Lobes

By C. W. Hinman

In the illustration is shown a design for a micrometer for measuring the rise on cam lobes in thousandths of an inch. This tool was designed primarily for obtaining the amount of rises on cams for automatic screw machines, but it can be used for the same purpose on any cam within its capacity, providing it has a center hole. A T-slot is milled lengthwise of the tool on the center line. Studs to fit the T-slot and the holes in the cams, are provided. Three sizes of studs will take care of all sizes of cams for B&S automatic screw machines. In addition to the body and studs for holding the cams, a square nut for clamping the studs in place, a knurled nut for binding the cams, and a commercial micrometer head and a bracket to hold it, complete the tool.

In operation, the micrometer is set to zero and the cam to be measured is put on the stud. The stud is loosened and it and the cam are moved toward the



Micrometer for measuring the rise of cam lobes

micrometer until the lowest point of the cam touches the spindle. The stud is then locked. The micrometer spindle is backed away and the cam is rotated until the high point of its lobe is in line with the spindle. If the micrometer spindle is now advanced until it touches the high point of the lobe, the amount of rise in the lobe can be read in thousandths of an inch.

Spot Welding in Experimental Work

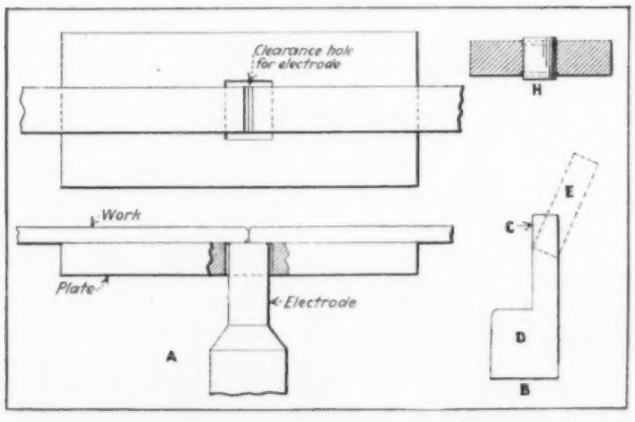
By Gus Haessler

In experimental work there are generally considerable alterations to be made in the parts, which can be greatly facilitated by electric welding.

A simple method of joining parts by spot welding is shown in the illustration. The abutting ends of the work are beveled on each side, so that when they are brought together V-grooves are formed, as shown at *A*. The work is laid upon a plate in which there is a clearance hole for the lower electrode of the welding machine. The plate may be tapped for screws if the work is to be held by strap clamps, though ordinary parallel- and C-clamps are generally used. Iron wire is employed for the welding rod and is laid in the V-groove in the upper surface of the work.

The upper electrode of the machine is brought into contact with the iron wire, forcing the work against the lower electrode. The work is thus spot-welded on the upper side of the joint. The operation is repeated on the other side, the work having been turned over and the iron wire placed as before.

Another job, shown at *B*, is handled in the same manner. The portion *C* of the piece *D* is cut off so that a butt joint is formed where the piece *E* comes in contact with it.



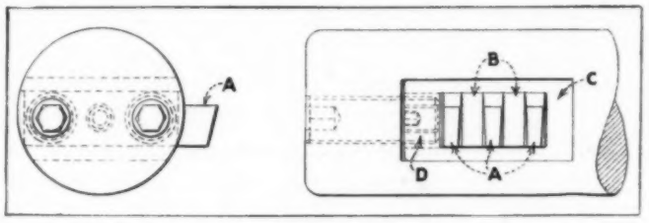
Making alterations by spot welding

Obsolete holes can be plugged as shown at *H*. The holes are slightly countersunk. Plugs somewhat longer than the thickness of the metal are put in the holes and held by spot welding.

Holding Grooving Cutters in the Turret Lathe

By J. E. Fenno

The illustration shows a method of holding multiple grooving cutters in a turret-lathe bar. The cutters *A*, together with their spacers *B*, are held as a unit in the member *C* by the setscrew *D*. The member *C* is a sliding fit in the bar where it is held by two hollow-head



Method of holding multiple cutters in a bar

setscrews which pass through clearance holes in member *C* and bear directly against the cutters.

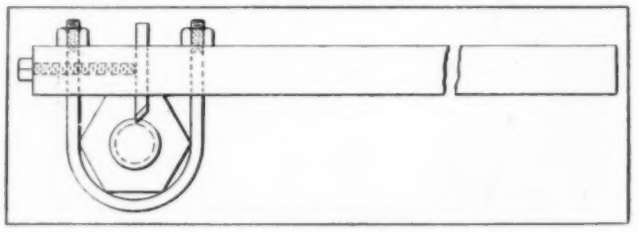
The bar proper can be used for many other jobs requiring different sizes of cutters and spacers. In the design shown, several cutter units are assembled under one tool number. Besides facilitating the making of tool records, this design results in less handling at the toolcrib, and also eliminates the possible loss of the separate cutters and spacers.

Cutting Threads Without a Die

By Charles Kugler

A jobbing shop made four 2-in. bolts to hold an engine to its concrete foundation. After the bolts had been set in the concrete, it was discovered that the threads were not cut far enough on the bolts to permit the nuts to come down on the engine bed.

Not having a threading die, the makeshift device



An improvised threading device

shown in the illustration was used with good results. A nut screwed on the threads of the bolts was attached to a steel bar, near one edge, by a U-bolt. A threading tool was put through the bar near the other edge, and was held in place by a long setscrew.

By rotating the nut by means of the bar and tapping the threading tool lightly with a hammer, the bolts were threaded to the proper length.

Standard Tungsten-Carbide Tools

(Continued from sheet No. 17)

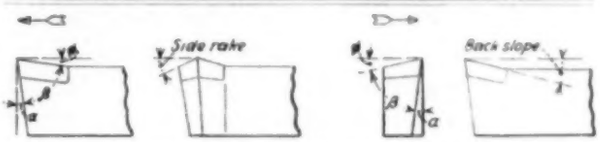
Recommended grinding angles for tungsten-carbide tools for various materials, and for tipped bits for all materials, are given in the accompanying tables. These tools should be ground with special wheels, preferably wet with a plentiful supply of water, the roughing operation being followed by a second or finish grinding operation, using a finer wheel in order to produce the sharp edge which is essential.

The peripheral speed of the grinding wheels should be about 65 to 85 ft. per second. The pressure required for grinding is not greater, and the time and cost of grinding with the recommended type of wheel is approximately the same, as when grinding "high-speed steels." Sudden changes in temperature must be avoided. The final finish grinding should be done by hand because the required fine edge can be obtained only in this manner. In order to save the special wheels, it is recommended that the tool shank be ground on ordinary emery wheels, and only the Widia tip on the special wheels.

In general, the tungsten-carbide tools are used dry. However, the cutting speed can be increased when a coolant is used, especially on a finishing cut. It is very important that a rigid support be provided, and that chattering be avoided. A bent form of tool is recommended for roughing work as the side pressure on the cutting edge is better taken care of in this manner. The tool is likely to break if the rotation of the work is stopped with the feed on. In planing and slotting, it is necessary that the tool be lifted clear of the work on the return stroke as otherwise the cutting edge will be damaged. For turning steel the edge of the cutting tool should be set about one per cent of the diameter of the work above center; for turning brass, bronze, and cast iron, and for boring any material, the cutting edge should be set on center.

The greatest output secured by the use of tungsten-carbide tools is obtained by an increase in the cutting speed while retaining the usual size of chip.

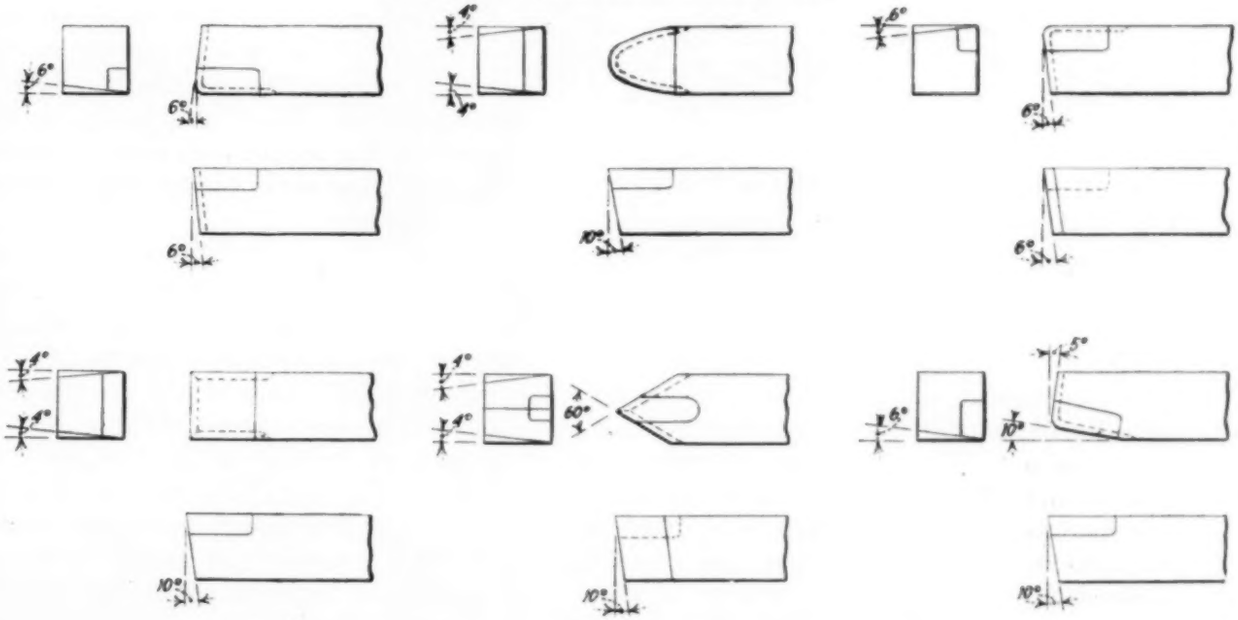
Standard Tool Angles for Various Materials



Use	α Clearance Deg.	β Tool Angle Deg.	φ Top Rake Deg.	Side Rake or Back Slope Deg.
General	7	72	11	4
Medium steel	7	67	16	4
Soft steels, aluminum alloys, stainless steels, soft steel castings	8	62	20	4
Chilled cast iron, silicon cast iron	3	83	4	4
Planer and shaper work (all materials)	4	77	9	13

The arrow indicates the direction in which the tool usually enters the cut. It may be desirable to depart slightly from these angles, in some cases, to take care of variations in the factors mentioned. The clearance angle α is dependent upon the tensile strength of the material to be cut, the kind of cut (whether interrupted or not), the diameter of the work, and the setting of the tool in relation to the center of the work.

Standard Tipped Bits for All Materials



As Recommended for Widia Metal by Thomas Prosser & Son

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Advertising the Industrial Product

ADVERTISING won recognition as a powerful sales tool years ago, but there are still advertisers who do not understand how skillfully it must be handled to get the maximum return from it. Much advertising has been wasted because the men down the line in the sales department did not co-ordinate their efforts with the program laid out by the advertising manager. Some of them were not "advertising minded."

The recent announcement of the advertising plans of the Westinghouse organization shows a keen realization of the importance of co-ordination of effort in such a campaign, and particularly of instilling "advertising-mindedness" in the sales staff. Last year's newspaper advertising of Westinghouse products brought home to the district sales heads the value of advertising to them and swung them from apathetic acceptance of the home office advertising to enthusiastic support of it. They found out that advertising could be made to help them in their work.

There may be other ways to achieve this result but the main point is that it must be secured, no matter what the cost. Industrial advertising cannot handle the sales job alone, it must be backed up by intelligent selling. One would as soon expect a high capacity machine to produce results without providing means for supplying it with raw material and for removing the finished work.

Mechanization and Foreign Trade

WORLD trade is steadily expanding in volume and is certain to reach undreamed-of limits within the next five years. Ample proof of this statement will be found in the series of articles by Dr. Julius Klein now running in the *American Machinist*. There are many obstacles to be overcome by each of the powers striving for international business, it is true, but when one looks at the whole picture he cannot but believe that the future is bright. The rate at which the European contestants in the war are recovering is amazing.

Every one is familiar with the advances made by the United States since the war but not so many know what the fundamental reason is. Without the mechanization of industry, which has reached its greatest development in America, there would have been little hope of competing with foreign-made goods in the markets of the world. The only way possible would have been the drastic lowering of the American standard of living through general reduction of wages. And that, of course, would have led immediately to a domestic crisis and a severe depression.

Bear in mind that only a few years ago the United States did not have the merchant marine, the foreign representatives, the banking facilities so necessary to success in foreign trading. Some improvement in those factors can be recorded now but the one great weapon has been quality at a competitive price, quality that came from accurate, high-production machinery. All of the factors mentioned must be improved as rapidly as possible but in turning attention to them it will not do to forget that mechanization has been the real cause of America's ability to compete.

Self-Sufficiency or Co-operation?

IT SEEMS terribly trite to say that the industry or the plant that attempts to solve all its problems within its own doors on the assumption that all the available information is known by its own men, is in serious danger. It has been said so many times before, yet there are still many people who are not convinced, or who will not admit the obvious statement that no one corporation or industry is strong enough to corner all the ideas.

Co-operation between companies, and between industries, has been a prominent factor in the success of the outstanding organizations in American manufacturing. There is a golden opportunity for more of this sort of joint action between trade associations, between engineering societies and between the two.

* * *

COMPLAINT comes from a machine tool user of difficulties encountered in securing necessary information regarding motors best adapted for the machine. Lack of such information made it impossible to place the order for motors without securing further details from the machine builders. The user feels that machine builders should supply their agents or other representatives with sufficient data concerning the motors needed to enable them to be ordered without delay. How can machine builders best designate the type of motors that will give satisfactory service?

Henry & Wright 75-Ton Dieing Machine

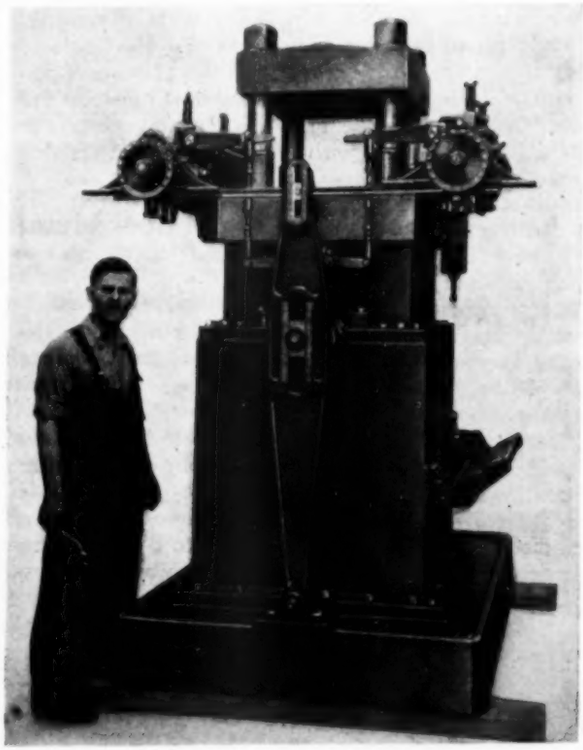
CAPACITY to produce metal stampings from heavier material than can be used on the 25- and 50-ton dieing machines, and also to permit the production of formed or drawn parts up to 2 in. in depth, in a single operation in progressive dies, is built into the 75-ton dieing machine introduced recently by the Henry & Wright Manufacturing Company, Hartford, Conn. The 75-ton machine illustrated has all of the die-saving and high-speed features of the smaller machines. In fact, to bear out claims for the die-saving qualities, the manufacturer states that 242,000 pieces of a certain automobile part, requiring both a piercing and a blanking operation, were produced on this machine from $\frac{3}{16}$-in. stock before regrinding of the die became necessary. Among the parts for which the machine is especially adapted are heavy hardware, automobile accessories, medium-size motor laminations and electrical parts. The two smaller machines mentioned above were described previously as follows: The 25-ton machine on p. 498, Vol. 49, and the 50-ton model on page 526, Vol. 55, of the *American Machinist*.

Convenient Feeding

Any proportion of this machine can be placed below the floor line and the starting and stopping treadles can be arranged so that they will be available for the operator at any desired height. This flexibility of mounting permits the material feed line to be placed at a convenient height for various weights of material. For example, some plants feed the heavier materials running up to $\frac{7}{32}$ in. in thickness at a point a little bit lower than the operator's waist line.

Both the upper and lower bases are made of semi-steel castings of ample proportions to eliminate vibration, which would be destructive to the dies. The entire machine is mounted on a floor plate 9½ in. thick, heavily ribbed in both directions for rigidity. The lower crosshead is guided on long ways of improved design to assure alignment at all times. The new style guide has a tapered gib, which can be adjusted from the outside of the machine at any time. The crosshead is also a semi-steel casting proportioned to secure maximum rigidity. The four guide rods are made from heat-treated, chrome-nickel steel, and are guided in long, adjustable, taper bronze bushings as in the smaller machines. The upper end of the connection is made from a steel casting bronze-bushed at the crankshaft bearings. The lower end of the connection or wrist is fitted into the lower crosshead, and has a large bearing area directly on the lower crosshead.

A crankshaft forged from high-carbon chrome-nickel steel, heat-treated and ground all over, is used. The clutch drum is forged integral with the shaft in order that the clutch pin may be placed as near the center of the shaft as possible. The crankshaft may be furnished in any stroke up to 8 in. The standard stroke, however, is 3 in., and the standard adjustment of the upper head is 3 in. The distance from the bottom of the bolster to the bottom of the upper head, stroke up and adjustment up, (open height) is 16 in., and the shut height for the standard stroke is 10 in. The overall dimensions of the upper base are 30¼x30¼ in., and the available work surface is 30¼x15 in. The hole in the upper head for the punch shank is 2 in. in diameter. A 12-in. hole may be had in the bed.



Henry & Wright 75-Ton Dieing Machine

With Henry & Wright roll feeds, the maximum width of metal that can be fed is 12½ in. and the length of feed may be from 0 to 8 in., standard, or up to 12 in., special. The minimum length of strip possible to feed is 46 in. Maximum height of metal line from bed of press to face of die is 7½ in. and the minimum height is 5½ inches.

The flywheel used is 50 in. in diam., and weighs 2,400 lb. This is a larger flywheel than is used ordinarily, but it is necessary, because the machine is operated in conjunction with automatic feeds and, therefore, is in more continuous operation than conventional machines, thus requiring more flywheel energy. The maximum speed is from 125 to 150 r.p.m., and 15 hp. is the recommended motor rating. The flywheel is fitted with two driving plugs made from a special alloy steel hardened and ground. A new design of backing-up plug is used, which locks the clutch pin with the flywheel at all points of the stroke, so that at no time can the reciprocating parts travel ahead of the flywheel, even on the longer strokes, or where heavy spring cushions are used. Because of this feature the life of the clutch pin and driving plug is materially increased. The brake is of the same type as used on the smaller machines, and releases automatically when the machine is in continuous operation. The clutch pin cannot engage the driving plugs until the brake is entirely released, nor be withdrawn until the brake is closed.

All of the reciprocating parts are

counterbalanced by two springs placed under the lower crosshead and carried in tubes extending 24 in. below the floor plate. The spring load may be varied by an adjusting nut located on the top of the tube, in the event that tools of unusual weight are used. The springs are 60 in. long, and have a very low unit deflection load so that the total spring load varies slightly even on an 8-in. stroke machine. All bearings are lubricated by means of the Alemite Zerk system. These fittings have been grouped at several accessible places.

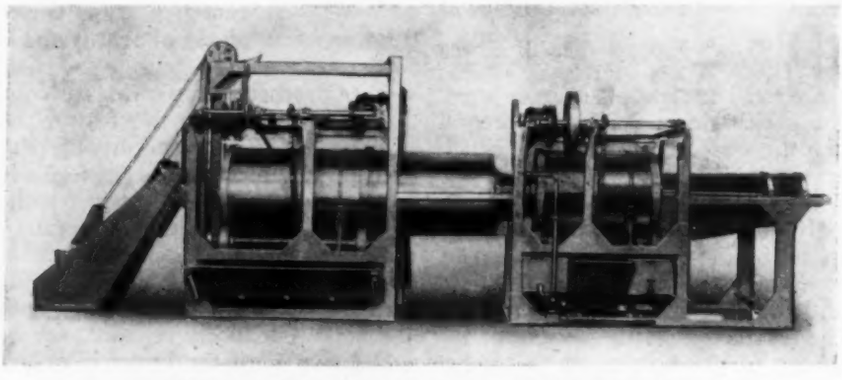
The weight of the standard machine equipped with a double-roll feed and bolster plate is 21,000 lb. The floor space is 60x73 in., and the height is 96 in. overall.

"Ideal" Combined Tumbling and Pickling Machine

A MACHINE that combines the operations of tumbling, pickling, and washing has been developed by Ideal Industrial Machinery, Division of the Consolidated Concrete Machinery Corporation, Cincinnati, Ohio. The machine is made up of two units. The first unit is a star return tumbling barrel with a lead-lined tank underneath for catching the 2 per cent sulphuric-acid pickling solution, which is pumped over the work while the tumbling is taking place. The drum itself is constructed of $\frac{3}{4}$-in. plate so that a long life will be insured even with constant contact with the acid. The pump is of bronze, and the connecting pipe is of lead. It is stated that the average drop forging requires only 10 to 20 min. for complete de-scaling. The acid flows out of the holes in the periphery of the drum and carries the scale back into the tank, where it settles to the bottom.

The star return barrel discharges the work into the second unit, which is an Ideal No. 5, Continuous-Process, Metal-Cleaning Machine. The work passes directly through this machine, which is filled with alkaline cleaning compound. The compound washes off the sludge of tumbling, neutralizes what remains of the acid, and, at the same time, since it is heated, brings the work up to a sufficiently high temperature so that it will dry without rusting.

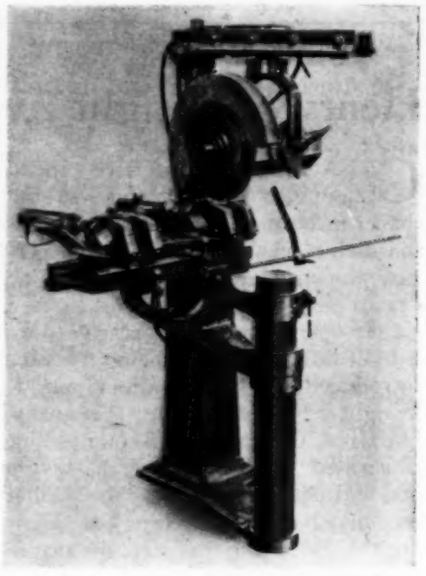
Unit No. 1 was described on page 182, Vol. 69, of the *American Machinist*. The combined machine may also be used for cleaning parts covered with scale from heat-treating.



Ideal Combined Tumbling and Pickling Machine

DeWalt "Wonder Metal Worker" Saw

Tubing and formed metal can be cut rapidly and smoothly by means of the "Wonder Metal Worker" saw announced by the DeWalt Products Corporation, Leola, Lancaster County, Pa. The machine illustrated is driven by a 5-hp. overhead motor, and the cutting unit is adjustable to any angle. It will cut standard tubing up to 3 in. in diam. and having a $\frac{1}{8}$-in. wall thickness, making a clean, accurate cut. The saw operates at 3,600 r.p.m., and will give three to four days' continuous operation on cutting molybdenum steel tubing of $\frac{1}{8}$-in. wall thickness



DeWalt "Wonder Metal Worker" Saw equipped with Bowlby "Air Vise"

before resharpening. Eight to ten days is the usual service on low-carbon steels before resharpening. The saw is 12 in. in diam., and is hollow ground. A manual feed is provided for even feeding of the saw to the material, thus producing a smooth cut for joining.

For holding the work, an air-actuated vise, developed by the Bowlby Air Devices, Inc., 1500 Fairview Ave., Wichita, Kansas, is used. This device is described below.

Bowlby "Air Vise"

Tubing and various formed sections may be held securely in this "Air Vise," which is intended primarily for attachment to the De Walt "Wonder Metal Worker" described in the preceding article. The vise has been placed on the market by the Bowlby Devices Company, 1600 Fairview Ave., Wichita, Kansas. Forward, backward, vertical and horizontal adjustments can be made quickly. An air trip actuates the jaws. A view of the vise is available in the illustration accompanying the De Walt "Wonder Metal Worker" announcement.

The Air Vise consists of a table and standard upon which are located the pistons and air-actuated vise jaws. The air pressure may vary from 30 to 150 lb. per sq.in., but pressures above 50 lb. per sq.in. are necessary to obtain the most rigid clamping when cutting above $\frac{1}{2}$-in. standard-gage tub-

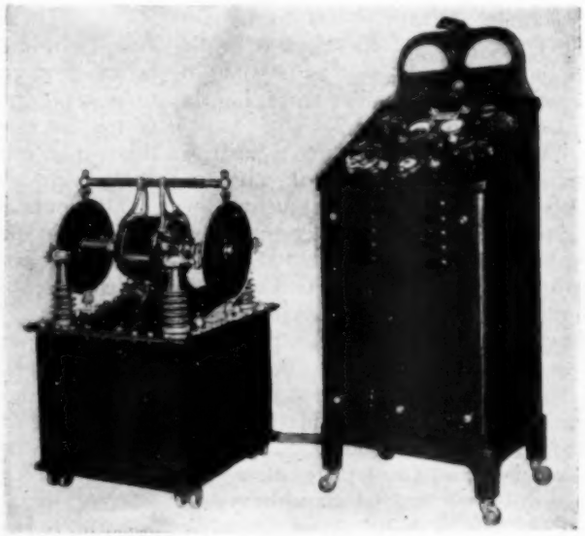
ing. A feature is the interchangable jaws, which permit the installation of heavier jaws, when large size pieces are to be cut. A changeover may be made in 5 min. The pistons operating the jaws are fitted carefully into cylinders having compression rings to prevent wasting air.

"Keleket" X-Ray Apparatus

METAL sections up to 3 in. in thickness can be inspected for hidden defects by means of the "Keleket" X-ray apparatus developed by the Kelley-Koett Manufacturing Company, Covington, Ky. Such apparatus permits the determination of the results of faulty technique in casting, forging or drawing, and permits the development of new methods that will insure uniformly good results. Although several sizes of apparatus having different peak voltage limits are built, the 140,000-peak-voltage model illustrated is the most suitable for industrial requirements.

X-ray pictures from the maximum of 14x17 in. down to 2x3 in. can be made of the part under inspection. The thickness of the material to be examined usually governs the distance between the work and the X-ray tube. It may be said that the intensity of the X-ray varies inversely as the square of the distance used between the piece and the tube, and that the penetrating power of the ray varies relatively as the square of the voltage with which the tube is energized. Therefore, a peak voltage of 140,000 volts and a working distance up to 7 ft. from the specimen are the working limits of the apparatus described. The units illustrated are those forming the generator for energizing a Universal X-ray tube. The larger cabinet at the right contains the controls, while the smaller unit at the left combines the rectifier and transformer. The control cabinet is constructed entirely of metal and no live connections are located on the switchboard. The X-ray tube requires a unidirectional current so, therefore, the transformer apparatus is equipped with a high-tension rectifier, which can be supplied to suit any commercial voltage or frequency. However, the standard model supplied is for 220-volt, 60-cycle circuits. The rectifier is of the double-disk type, each disk receiving one-half of the potential. This construction is balanced and, therefore, long life of the motor bearings may be expected.

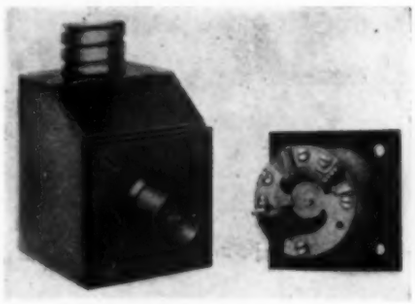
The overall dimensions of the transformer rectifier unit are 21 in. wide by 22 in. deep, by 32 in. high, and those for the control unit are 20 in. wide by 21 in. deep by 54 in. high. The weights are 585 and 225 lb., respectively.



"Keleket" X-Ray Apparatus for energizing a Universal X-Ray tube

Lincoln Safety Push Button

In this push button an unusual design is used to prevent machinery from being started accidentally, with attendant danger to the workman. The device has been placed on the market by the Lincoln Electric Company, Coit Road and Kirby Ave., Cleveland, Ohio. As illustrated, the ball top "start" button is contained inside a large "stop" button which projects over the start button. Thus, the large projecting stop button protects the start button from accidental contact. The start button can only be operated by the tip of the finger inserted inside the stop button. The start button is of molded green Bakelite, while the stop button is of brilliant red Bakelite.

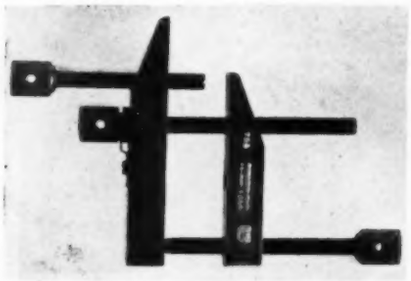


Lincoln Safety Push Button

The inner mechanism is inclosed in an arc-welded steel box 2½x3¼x2½ in. in size. All insulating parts are of molded Bakelite. The exterior finish is jet black with the exception of the push button. Four screws hold the black Bakelite faceplate as shown at the right hand of the illustration, to the container. By removing these screws the entire operating mechanism can be removed from the case for wiring. The binding posts are plainly indicated by white letters on the black background. An opening ⅞ in. in diam. at the top of the steel case permits the entrance of the conduit. This safety-type push button was designed primarily for use with the Lincoln induction starter, but it is available and suitable for use with any type of push-button starter.

Brown & Sharpe No. 756 Toolmakers' Clamp

A long jaw for clamping pieces that a regular clamp will not hold is the feature of the No. 756 toolmakers' clamp, which has been placed on the market by the Brown & Sharpe Manufacturing Company, Providence, R. I. As shown in the illustration, the auxiliary screw and the longer jaw give support and rigidity and prevent slipping of pieces that ordinarily can not be held between the even jaws of plain clamps. The spring attachment on the adjusting screw holds the loose jaw in position at all times. The jaws are rounded on the ends to allow clamping under a shoulder, and the



Brown & Sharpe No. 756 Toolmakers' Clamp

long jaw extends over the top, far enough to clamp the piece. The No. 756 clamp can be used with any Brown & Sharpe V or handy block. The device is made in two sizes, the jaw openings being 2 and $2\frac{1}{2}$ in., respectively.

"Namco" Opening Dies and Collapsing Taps

Additions to the "Namco" line, manufactured by the National Acme Company, Cleveland, Ohio, comprise an opening die for threading ordinary capscrews, and two collapsing taps, the Style CR being of the revolving type, while the Style CS is of the stationary type. All three tools are designed for cutting very accurate threads. Their chief feature is that the chasers may be removed almost instantaneously without removing the tools from the machine. This operation is performed by loosening one screw, pushing back the cup or body of the tool to release the chasers, and removing them with the thumb and finger. To slip in a fresh set of Namco chasers, the cup or body is snapped back into position, one screw is tightened, and threading is started again. The setting of these Namco threading tools is undisturbed by the insertion of a fresh set of chasers.

Fig. 1—Inserting chasers in the "Namco" Style CR Opening Die of the revolving type

Other features of the opening die are that the Namco chasers in the released condition are held from dropping out by a brake shoe arrangement, and there are only three major parts. The dies are hardened and ground throughout. These dies are designed to supplement rather than to replace the regular line of Namco opening dies. Where work larger than standard capscrews must be threaded close to a shoulder, the regular Namco dies are recommended, as the overhung chasers permit of close-to-shoulder threading. However, the opening in the front plate of the Style CR die has been made as large as possible to permit close-to-shoulder threading on ordinary standard screws.

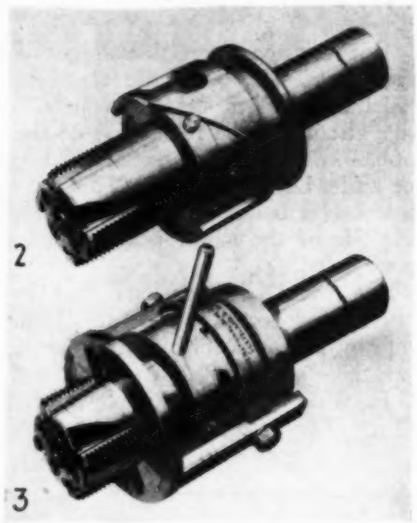


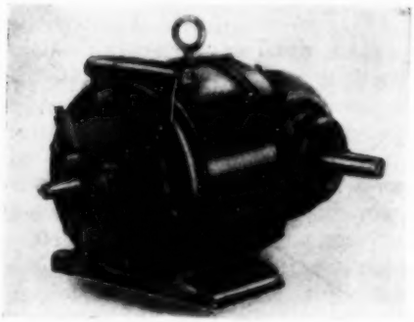
Fig. 2—"Namco" Model CR revolving collapsing tap. Fig. 3—Style CS stationary-type collapsing tap

The collapsing taps have a positive cam action for collapsing the chasers. This cam mechanism prevents the chasers from tipping, thereby eliminating tapered threads. Positive adjustment is effected by two opposed screws, which are self-locking. Full length bearing of the chasers on the core piece is a feature, the chasers being designed so as not to overhang the core piece. All parts are hardened and ground throughout. The open core piece and front plate allow very fine dust, chip particles and heavy oil accumulations to be blown from the tap by means of compressed air. The design of these tools is such that no chips or dirt can find their way to the interior.

The opening die is made in five sizes and the capacities are $\frac{7}{16}$, $\frac{9}{16}$, $\frac{13}{16}$, 1, and $1\frac{5}{8}$ in., respectively. Both the Models CS and CR collapsing taps are provided in similar size ranges, the sizes being $2\frac{1}{4}$, $2\frac{5}{8}$, $3\frac{1}{8}$, $3\frac{5}{8}$, $4\frac{1}{8}$, and $4\frac{5}{8}$ in., respectively.

Morrison Types A.R.U. and A.R.P. Helical-Gear Right-Angle Speed Reducers

To make its line of helical-gear speed reducers applicable to drives where the slow-speed driveshaft must be at right angles to the high-speed shaft, the Morrison Machine Company, Paterson, N. J., has brought out the models A.R.U. and A.R.P. helical-gear, right-angle speed reducers. The helical-gear reduction section similar to a drive previously manufactured forms the essential part of this unit, the section comprising the right-angle drive being added to it.



Morrison Type A.R.U. Helical-Gear Right-Angle Speed Reducer in which the high- and low-speed shafts are adjustable about the intersecting horizontal center lines

The outstanding feature of the unit is the quick adjustability of the high-speed shaft to suit the motor to which it is to be connected. This is accomplished by loosening the clamp on the top of the housing, rotating the complete gear train until the shaft is at the proper height, and then reclamping it in position. The illustration shows the gear train turned clockwise from the vertical center line of the unit to a position slightly below the horizontal center line. This feature obviates the necessity for pads under the seat of the motor or the

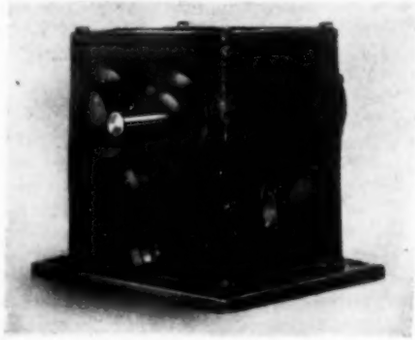
reducer in order to bring the shafts into alignment. The slow-speed shaft, which is placed at right angles to the high-speed shaft, is also adjustable to any one of eight positions, these being vertical above and below, horizontal on either side, and at 45 deg. from the horizontal in any direction. Anti-friction bearings are used throughout, and the elimination of stuffing boxes is brought about through the adoption of a special oil seal. This right-angle drive is made in a number of sizes and capacities in ratios from 6 to 1 to 1,458 to 1.

Morse Stock Chain Drives

Chain drives from 2 to 20 hp. are now carried in stock at the district offices and distributors of the Morse Chain Company, Ithaca, N. Y. Bulletin No. 35 has been prepared, giving the horsepower, driver and driven speeds, and driver and driven bores, and also center distances in some cases. This bulletin permits easy selection of a stock drive best suited to a particular requirement. The horsepower ratings are based on an allowable pull per inch of width of chain only 60 to 80 per cent of that given generally. For intermittent use under favorable conditions, these horsepower ratings can be raised 25 to 50 per cent. Oiltight chain cases having welded seams and leather packing around the shafts are available for these drives.

"WHS" No. 4D Speed Reducer

Speed reduction ratios from 100 to 1 up to 2,500 to 1 are obtainable in the No. 4D speed reducer manufactured by Winfield H. Smith, Inc., Springville, N. Y. The mechanism consists of a double worm gear drive having the driven and driving shafts parallel. It is particularly suitable for light conveyor drives where a large reduction is required.

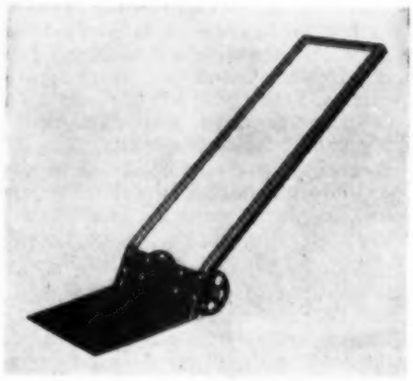


"WHS" No. 4D Speed Reducer

Ball thrust bearings are fitted at each end of the two worm shafts. The material used for the gears is a high-grade gear bronze, and the worms are of steel, hardened and polished. Because of the large ratio of reduction, the actual horsepower ratio is very small. Dimensions are 7⅞ in. high, 7½ in. wide, and approximately 11 in. from end of driven shaft to end of driving shaft. The weight is 48 lb. net.

Pollard Pick-Up Truck

One standard size of this pick-up truck is manufactured by the Pollard Brothers Manufacturing Company, 4034 North Tripp Ave., Chicago, Ill. By pushing the truck under the load and exerting a moderate pressure on the handles, a load may be picked up ready for transportation to any point.



Pollard Pick-Up Truck

The load is carried directly on the wheels and so cannot fatigue the operator, as would happen if the part of the load had to be sustained by the handles. The wheels are 6 in. in diam. and may be furnished in plain semi-steel or rubber tired. The forks are steel, the handle is of angle iron, and the platform is of steel plate beveled at the edge. The platform is 14 in. deep by 16 in. wide. Black enamel is used for the finish. The weight is 25 pounds.

· REVIEW · OF · RECENT · PATENTS ·

Relating to the Machinery and Metal Products Industries

Metal-Working Machinery

A patent on a power chuck, 1,698,254, was assigned to The Bullard Company. It consists of a work table carrying chuck jaws, a tubular spindle, and a power-driven means of opening and closing the chuck in the forward and reverse positions of the work table. The clutch is controlled by a manually operated lever.

A patent on a taper attachment, 1,698,319, was assigned to the Cincinnati Lathe and Tool Company. The attachment comprises a swivel guide mounted to pivot on a channel which in turn is on a supporting member. A shoe, connected to the lathe tool slide, travels in a guideway and controls the traverse movement of the tool slide. A pinion in the swivel guide and a rack segment permit angular adjustment of the guide.

The Landis Machine Company was assigned a patent, 1,697,997, on a trip for die heads. The trip comprises a work contact head within the diehead body and a stem within the shank. The axial stoppage of the work by the trip enables the chasers to move the head body relative to the shank.

A patent, 1,698,685, assigned to The Blanchard Machine Company on an abrasive wheel covers the combination of a series of abrasive blocks held to the holder by a number of pivoted clamping yokes each spanning the inside of two of the abrasive blocks. The yokes are drawn in by bolts operated from the periphery of the holder.

Parts and Mechanisms

The Edgemont Machine Company, Dayton, Ohio, was assigned patent 1,697,904 on a friction clutch. It consists of two elements, one fixed to the shaft and the other journaled for free movement. One of the elements carries a friction ring, and the other carries an adjustable clamp collar. All operating parts of the clutch are adjustable.

A roller bearing cage patent, 1,698,075, was assigned to the Bower Roller Bearing Company, Detroit. The rollers are placed in a cage formed to permit radial movement, and the inner ring is inserted while the rollers are permitted radial displacement. The cage is then pressed into shape to prevent radial movement.

A patent on a lubricator with pump attachment, 1,698,157, was assigned to the Imperial Brass Manufacturing Com-

pany, Chicago. A lubricating device for feeding oil to crankshafts was patented, 1,698,241, and assigned to Hugo Junkers, Dessan, Germany. Three separate patents, 1,698,654, 1,698,655, and 1,698,660, on packings were assigned to Metalastic, Inc., Jersey City, N. J. In general the packings consist of asbestos or fibrous material, graphite or antifriction metal particles, and a waxy material.

A patent on an apparatus for metallic arc welding, 1,697,864, was assigned to the Chicago Steel & Wire Company. The apparatus consists of a mechanism for feeding the electrode welding wire continuously to the work.

Materials

A patent on a heat-resistant metal, 1,698,098, was granted to Noak Victor Hybinette, Wilmington, Del. The alloy contains approximately 30 per cent of chromium, 35 of nickel, and the balance iron. Besides being heat-resistant, it is also resistant to acids and hot alkali.

A soldering material containing a flux that will remove enamel was patented, 1,697,845, and assigned to the Western Electric Company, Inc. The flux, which is contained in the soldering metal as a core, consists of 1 part of naphthalene and 2 parts of rosin.

A process for reclaiming used lubricating oil contaminated with water and solids was patented, 1,698,257, and assigned to the De Laval Separator Company. The process comprises heating the impure oil to about 210 deg. F. and dissolving in it caustic soda. It is then run through a centrifuge.

Trade Publications

ARC WELDERS. The General Electric Co., Schenectady, N. Y., has published catalog 1,031-A, superseding 1,031, on type AW resistor arc welders in three styles, the first being for 60 volts in capacities from 200 to 500 amp., the second for 200-275 volts in capacities from 60 to 200 amp., and the third for 400 to 650 volts, in capacities from 200 to 300 amp. All styles are illustrated and described.

ARC-WELDING ACCESSORIES. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has published Leaflet 20,398, describing arc-welding accessories, which include protective welding helmets, hand shields, metal electrode holders, carbon electrode holders, welding cable, and welding circuit reactors.

"COBALTCROM" PRK 33 STEEL. The Ziv Steel & Wire Co., 2945 West Harrison St., Chicago, Ill. is agent for Darwin & Milner, Inc., Cleveland, Ohio, American Division of Darwins Ltd., Sheffield, Eng., for the patented "Cobaltcrom" PRK 33 steel, which may be used for all kinds of dies, cutting tools, shear blades, pneumatic hammers and valves for internal combustion engines. Its chief features are air-hardening, non-scaling, non-deforming and simplicity of treatment. Heat-treatment and production figures for various purposes are given.

FACTORY EQUIPMENT, STEEL. The Pollard Brothers Manufacturing Co., 4034 N. Tripp Ave., Chicago, Ill., has published a catalog entitled, "Factory Equipment—Steel," which shows a series of bench legs, benches, tables, tool stands and tenders, tool boxes, and trucks of various types and sizes. Each product is described and specifications are given.

FIRE APPARATUS. The Wirt & Knox Manufacturing Co., York St. and Sedgley Ave., Philadelphia, Pa., has published Catalog A-28, showing many types of fire apparatus for factory use. This catalog contains 63, 9x6-in. pages.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has published two bulletins on welding apparatus. The first, known as Bulletin 823-B, superseding 823, is devoted to a description of atomic-hydrogen arc-welding equipment. Bulletin 1,022-A, superseding 1,022, illustrates and describes the operation and construction of an arc welder for manufacturing steel ties for railroad use.

GRINDING JOBS. The Gardner Machine Co., Beloit, Wis., has issued a catalog entitled, "Typical Jobs for Standard Gardner Grinders," which shows hand-operated equipment mainly. Typical jobs performed range from small springs to boiler parts. Each job is illustrated, the production times are given, and the wheel and machine sizes are stated. Photographs of the standard corrugated and deep-corrugated Gardner disks accompany the description of these wheels. The catalog contains 23, 11x8½-in. pages.

LATHES, PRODUCTION. The Porter-Cable Machine Co., Syracuse, N. Y., has published a catalog entitled, "Hi-Speed Production Lathes." After describing the construction and special features of the machine, examples of the many varied parts that can be turned out are illustrated. Examples of multiple tooling are shown by means of drawings, and special equipment is listed at the rear. The catalog contains fifteen 11x8½-in. pages.

"MIL-WAUKEE-MIL" MILLING MACHINES. The Kearney & Trecker Corporation, Milwaukee, Wis. has published catalog No. 36, which illustrates the "Mil-Waukee-Mil" production milling machines, which the company states is available in 1,000 different combinations of standard units. The construction and operation of this machine are thoroughly described, and are illustrated by means of photographs. Various examples of the work, which can be done upon them, are given. Specifications of the Simplex, Duplex and Triplex are appended in the rear of the catalog.

MOTORS, VERTICAL, SMALL. The Wagner Electric Corporation, St. Louis, Mo. has published Bulletin No. 158 on small vertical motors covering all types in ratings of ¼ to 1½ hp. All these motors have the same flange or lug dimensions, thus making them interchangeable for the same mounting. The vertical motors can also be mounted horizontally or obliquely. The line includes repulsion-induction, split-phase, squirrel-cage and d.c. motors for operation at 1,200 to 3,600 r.p.m. on 25 or 60-cycle circuits.

NICKEL CAST IRON. The Whitehead Metal Products Co., 304 Hudson St., New York, N. Y. has published a bulletin entitled "Insuring Dependable Properties in Grey-Iron Castings by the Use of Nickel." The bulletin is arranged in four parts: improved machinability, uniform structure, increased strength, and increased hardness, respectively. The various characteristics producing any of these features are cited, and various castings are shown.

SCREWS, SELF-TAPPING. The Parker-Kalon Corporation, 200 Varick St., New York, N. Y., has published a bulletin entitled, "The Evolution of the Screw," in which examples of screws made in very early times and up to the present are described. A portion of the bulletin is devoted to brief descriptions of various types of self-tapping screws manufactured by the Parker-Kalon Corporation. These screws cut their own threads as they are screwed or driven into the material.

THREADING MACHINERY. The Landis Machine Co., Inc., Waynesboro, Pa., has published Catalog No. 32, describing in detail the complete line of Landis bolt threading machines, staybolt threading machines, bolt factory threading machines, automatic forming and threading machines, and chaser grinders. It also contains data regarding the various bolt threading dieheads and also the Landis chaser. All products are illustrated by means of photographs and, in many cases, dimension diagrams are given. Complete specifications for all products are listed.

WELDING RODS. The Chicago Steel & Wire Co., Fusion Welding Division, 103rd Street & Torrence Ave., Chicago, Ill. has published a pamphlet entitled "The Weldite Line of Welding Rods for Gas and Electric Welding." Four types are listed for gas or oxy-acetylene welding, while twelve types are available for electric welding.

News of the Week

Plans Broad Research in Alloys of Iron

Research in alloys of iron, described as the most ambitious undertaking ever attempted in this field, is planned by the Engineering Foundation in co-operation with the American Institute of Mining and Metallurgical Engineers, it is announced at the national headquarters of the Foundation in New York.

The industries, technical schools, bureaus of the United States Government, scientific organizations and foreign agencies will aid. The initial task, for which $150,000 has been appropriated, is a critical five-year review of all available literature in English and other languages, resulting in a series of monographs and manuals.

Following a conference of representatives of the various groups mentioned, a committee on alloys of iron research has been appointed. The chairman is John Johnston, director of research and technology of the United States Steel Corporation. Other members of the committee are:

F. M. Becket, president of the Union Carbide and Carbon Research Laboratories; H. W. Gillett, chief of the Division of Metallurgy, U. S. Bureau of Standards; James T. MacKenzie, metallurgist and chief chemist of the American Cast Iron Pipe Co.; and A. J. Wadhams, manager of research and development of the International Nickel Company.

Devoted to Fundamentals

The announcement explains that the future progress of the American iron and steel industry will be greatly affected by its ability to maintain a strong position in alloy irons and steels. It has taken forty or fifty years to develop the present state of the art for carbon steels through contributions from time to time by those engaged in iron and steel manufactures. The world is moving too fast now to await a similar deliberate development for alloy irons and steels. The time appears opportune for a co-operative research to be devoted largely to the fundamentals, leaving the individual companies to build upon this substructure their own specific technical developments.

Users and makers have acquired knowledge from experience and research. A vast literature has accumulated, in many languages, marred by errors, disagreements, and gaps. It must be consulted, but lack of orderly arrangement, of classification, of evaluation, of accessibility, and of generalization causes much waste of time and money. Hence the first task will be classification.

The second phase of the program, which, it is expected, will extend over a long period of years, will be research directed toward increasing fundamental knowledge of iron and its combinations with other substances, particularly alloys of pure iron with one or two or three or more other pure metals; also the effects of the impurities incident to practical operations.

Will Show How Methods of Automotive Plants Can Be Used Elsewhere

A combined materials handling and production management meeting of the A.S.M.E. of national scope has been planned for Detroit, May 1 to 4. The object of the meeting will be to show how methods employed in the automotive industry can be applied to other industries. The main papers will be written and presented by prominent Detroit engineers, and leaders of industry outside of the field also will be placed on the program as authors and discussers. The program is planned to give a complete picture of the latest methods and machinery used in the handling of production in Detroit industries, as well as giving a complete analysis of the production management phases. The meeting is jointly sponsored by the management division and the materials handling division of the A.S.M.E.

Material handling methods used in sheet metal shops, forge shops, foundries, miscellaneous parts shops, body building shops, machine shops, and general assembly shops of the automotive plants will be explained first, and afterward an attempt will be made to show how such methods may be applied to the electrical manufacturing industry, the furniture industry, and miscellaneous industries, such as are represented in the manufacture of cash registers, food products, adding machines, typewriters, and the like.

Financial Reports Show Progress in Industry

Bookings made by the Allis-Chalmers Manufacturing Co. in 1928 amounted to $35,957,197, compared with $30,651,807 in 1927, an increase of 17.31 per cent. Profits amounted to $2,934,000 as compared with $2,605,000 the previous year. Unfilled orders on hand, Dec. 31, 1928, amounted to $9,681,000.

The Eaton Axle & Spring Co. and subsidiaries reports a net profit of $1,197,527 for the first ten months of 1928, after depreciation and taxes.

Net profit for the Savage Arms Corporation and subsidiaries for 1928 was $615,978, as compared with $323,254 the previous year.

Net profit of the National Cash Register Co. for 1928 is estimated at about $8,500,000 on an estimated sales of over $50,000,000. These record results were accomplished in the face of a $2,000,000 expenditure on factory machinery and improvements. A profit of about $7,000,000 was made the previous year.

The report of the Air Reduction Co. for 1928 shows a net profit of $3,208,993, compared with $2,412,596 in 1927.

The Scoville Manufacturing Co. made a net profit of $2,698,508 in 1928 after charges, compared with $2,253,218 the previous year.

The United Engineering & Foundry Co. reports a net profit in 1928 of $826,591, compared with $1,642,392 the previous year.

The National Rubber Machinery Co. made a net profit in 1928 of $385,006, compared with $304,006 the previous year.

A.S.M.E. Sectional Meeting Slated for Rochester

The technical program for the sectional meeting of the American Society of Mechanical Engineers to be held at Rochester, N. Y., May 13 to 16, will include sessions on mechanical power transmission, gears, mechanical springs, applied mechanics, wood industries, management, materials handling, education for industry, metals at high temperatures, and topics on power plant subjects. Frank H. Evans, director of the course of development at the Rochester Mechanical Institute and chairman of the Rochester Section of the A.S.M.E., has been chosen as general chairman of the committee on arrangements.

Offer Prizes for Slogan on Electric Heat

Seven prizes, totaling $500, will be awarded by the National Electrical Manufacturers Association and the National Electric Light Association for the best slogans to promote the use of electric heat in industry. Each contestant may submit not more than three slogans and each slogan must be accompanied by an analysis not exceeding 100 words. Preference will be given to brevity in slogans. The contest closes on May 30, 1929, and the results will be announced in the following month. Slogans should be mailed to the NEMA-NELA Slogan Contest, National Electrical Manufacturers Association, 420 Lexington Ave., New York.

Safety Records Set By New York Shops

Although 1,183 lives were lost in New York City's industries during 1928, not one of the 9,275 employees of the 93 metal-manufacturing plants lost his life. There were but 269 lost-time accidents recorded in all of the metal-working plants, and 36 plants went through the year without one lost-time accident. This information was brought out as the result of an accident prevention contest among metal manufacturers which was held under the auspices of the Merchants' Association of New York.

The winner of the contest was Frank J. Quigan, Inc., of Brooklyn. The employees of this firm worked a total of 643,466 hours with no lost-time accidents. The Metropolitan Iron Foundry, also of Brooklyn, was second with a total of 205,849 man-hours without lost-time accidents.

The data collected indicated that the largest number of accidents occurred in the handling of material. The 269 accidents mentioned were distributed as follows:

Flying objects	3
Flying particles	13
Falling objects	35
Handling material	32
Slipping and stumbling	12
Falls	10
Protruding nails	4
Acids	2
Motor vehicles	3
Hand tools	27
Slivers and splinters	3
Hand trucks	6
Conveying apparatus	6
Stropping machines	1
Power presses	35
Power shears	1
Power saws	2
Buffing machines	2
Brake machines	1
Milling machines	2
Grinding machines	6
Lathes	4
Automatic hammers	1
Miscellaneous	8

The experience of the Quigan firm is of special interest because of the demonstration it has provided of financial savings brought about by organized safety efforts. Whereas in 1923 the firm paid $3.08 per hundred dollars of pay roll for compensation insurance, in 1928 this figure was reduced to $1.21, and the firm estimates that it has saved about $7,000 a year.

Standardization Projects Under Way

The proposed standards for tool holder shanks, and tool post openings have been formally approved by the National Machine Tool Builders' Association, the Society of Automotive Engineers, and the American Society of Mechanical Engineers, joint sponsors for the sectional committee on the standardization of small tools and machine-tool elements. This proposed standard is now before the American Standards Association for approval and designation as an American Standard.

The sub-committee of the sectional committee on the standardization of bolts, nuts, and rivet proportions of the A.S.M.E., sponsored also by the S.A.E., is being organized to review existing company specifications for socket-head capscrews, upon the request made by several large manufacturers that this item be standardized. This is another step in the direction of standardization of machine tool elements.

An Old Timer Retires

W. S. Rogers, the man who pioneered the ball bearing manufacturing industry 31 years ago, and president of the Bantam Ball Bearing Co., Bantam, Conn., has sold out his control in the business and retired. Thirty years ago he made the ball bearings for the first Stanley Steamers, the Mobile, Locomobile, Olds, King, Lozier, Winton, Ford, and in fact all of the early horseless buggies when the automobile was in the inventive stage. He was an active member of the American Society of Mechanical Engineers for 40 years and had a long experience in engineering and management. The old time readers of *American Machinist* will perhaps recall his humorous "Sketches of an Apprenticeship" that ran in this magazine during the eighties.

Mrs. Nellie Scott Rogers, for the past 25 years treasurer of the Bantam Ball Bearing Co., has also disposed of her interests in the company and retired for a much needed rest. Mrs. Rogers is one of the six women associate members of the A.S.M.E., and is also a member of the Society of Automotive Engineers, and is widely known as an expert accountant and financial manager.

German Corporation Formed to Finance Machinery Purchases

By Our Berlin Correspondent

ONE of the most serious problems of German industry in past years has been and still is the difficulty of granting credit facilities to buyers. Few manufacturers are in a position to go beyond the usual "payment 30 days after receipt of invoice." Capital is accumulating but slowly and is still insufficient to carry an unpaid turnover of several months, and with bank rates still prohibitive credit can not be given on broad lines.

In view of this difficulty an organization was recently formed in Berlin with the object of enabling manufacturers to extend to buyers payment at easy terms. This organization, *Finanzierungs-Gesellschaft fuer Industrie-Lieferungen* (Corporation for Financing Industrial Supply), took its origin from a company formed some time ago on similar lines, with a narrower field however, its scope being restricted to agricultural machinery and implements. Having proved very successful and of conspicuous benefit to the farmer as well as to the manufacturers of such machinery, it was quite natural that an effort should be made to put the scheme on a broader basis and make it available for other kinds of product. The firm in question is endowed with a comparatively small capital, the working funds being supplied jointly by the large German banks, for whom the financing corporation are acting more or less in the capacity of trustees.

The scheme works as follows: the purchaser at the conclusion of the contract pays by bills of trade, drawn by the seller and payable within 18 months at certain predetermined intervals, usually quarterly. An interest of 10 per cent is charged and added to each bill for the time until maturity of the respective part payment. If a buyer avails himself of the whole extent of the credit scheme, that is of payments distributed over 18 months, the interest he has to pay amounts to about 9 per cent. The seller presents, after the purchase is made, the bills, indorsed by him, at the financing corporation and receives full payment less interest for them.

This scheme is very simple, but naturally there are some restrictions and clauses attached to it. It is confined to equipment representing a productive investment and not subject to rapid wear. Manufacturing and power generating machinery is included, but not boilers, because their value rapidly depreciates. The equipment thus purchased remains the property of the financing corporation until all bills given in lieu of cash payment are duly honored.

The financing corporation evidently exercises a strong and careful discrimination as to with whom it deals. Sellers and buyers must be established firms of good standing and new firms are exempted. In the case of the seller being a dealer and not the manufacturer himself, especial caution is used, and only firms of excellent and undisputable reputation are coming into consideration.

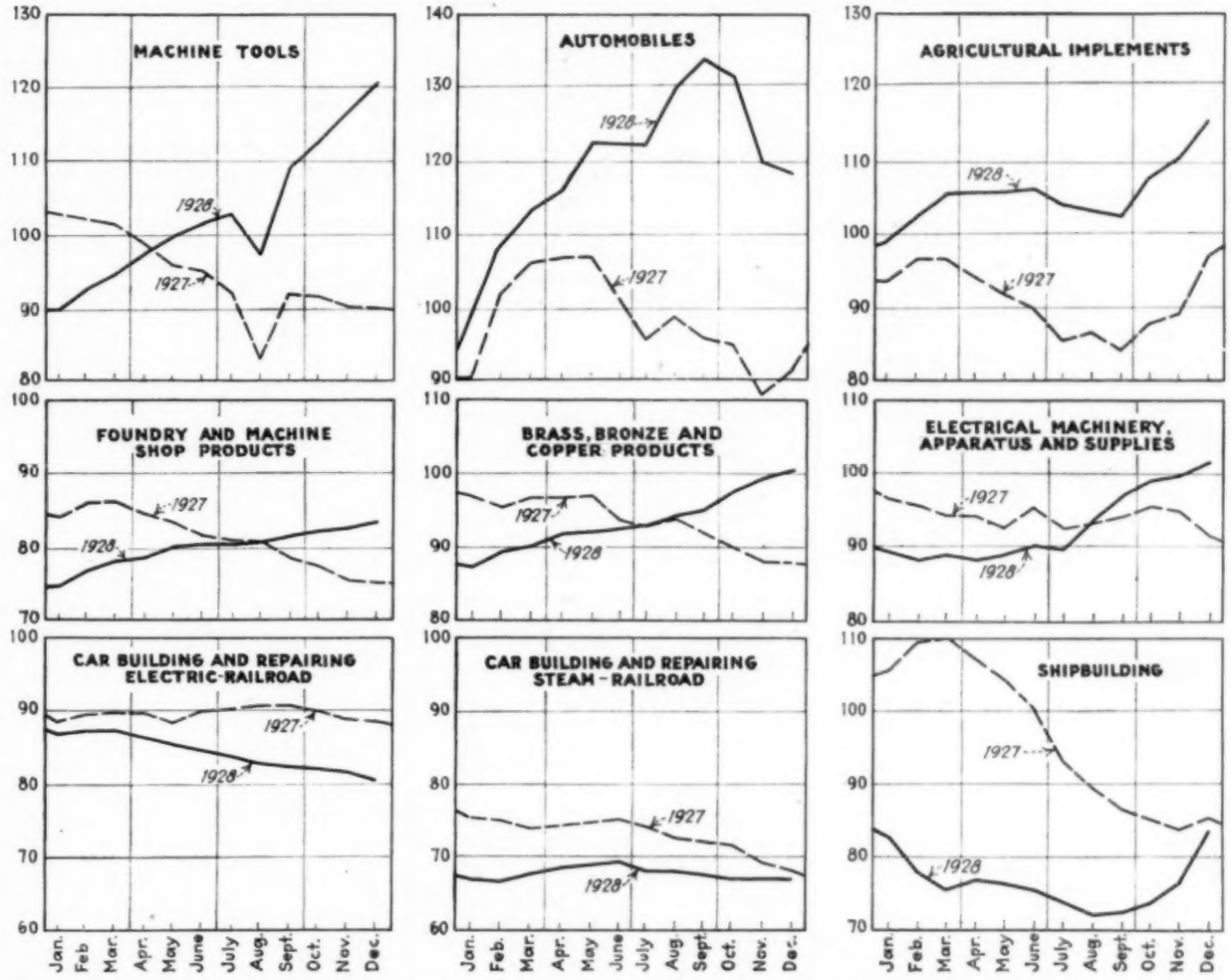
Spoilt By Overcaution

It could be expected that the new institution, filling a great need as it does, would be overrun with applications from buyers and sellers, and that it would require a huge amount of capital to cope with the demand. Such, however, apparently is not the case. Perfect in theory as the scheme no doubt is, it is, in the opinion of manufacturers, spoilt by overcaution and an abundance of formalities. Would-be applicants declare that they can find more ready accomodative at their local banks, without being required to subject their business to detailed investigation. The rate of interest they have to pay elsewhere may be a little higher, but this disadvantage is compensated by greater convenience on the other side.

Trend of Employment in the Chief Metal-Working Industries

Data Supplied by the Bureau of Labor Statistics

Monthly Average for 1923—100



The largest gain in numbers employed during the month of December, 1928, was registered in the shipbuilding industry, 7 points over that of November. Employment in machine tool shops rose 4 points, and in the agricultural implement industry, 48. Minor gains were also recorded in the brass and copper products industry, in the foundry and machine shop products industry and in the electrical machinery industry. There was a seasonal drop in the automotive trade of 1.6 points and small drops in the car building trades. All three of these groups, however, should show a corresponding rise when the January figures are available from present indications.

It is further contended that applicants fulfilling the severe requirements of the financing corporation are quite able to help themselves without outside assistance, and that those to whom the scheme would be a boon are excluded from it. Presumably the promotors of it are feeling their way at the start in order to judge the possibilities and gage the capital requirements, and they will probably loosen the rigid network of formalities as they go along. Doubtless this modification will have to be done, if the scheme is to be of real value to German manufacturers.

There is one point, particularly, where the financing plan fails entirely, that is in the matter of export and import. In this respect the existing need is strongest. Bills of trade given and taken by buyers and sellers of standing, residing in the same country, have almost the value of currency, but this advantage naturally ceases when buyers and sellers are of different nationality. Acceptances of foreign firms are hardly of any use in Germany and vice versa. Here is where the real difficulty begins, even for the most potent buyers and sellers, and where high finance with its wide reaching tentacles could be of greatest help. The management of the financing corporation recognize this point, but, willing as they are to keep it in consideration, they are for the present unable to cope with it.

An added difficulty exists in the case of import, as the promotors of the scheme seem to be of the opinion that it should benefit domestic sellers only. The management does not seem, however, to be averse to financing the purchase of foreign factory equipment of which no German substitutes of equal design and quality are available. This applies particularly to machine tools of foreign make, but in the case of such import there must be a German intermediary of undoubted credentials who assumes full responsibility for the transaction, for example, the big German machine tool dealers. If from such a side an application were made regarding the financing of purchases of foreign machinery, there is every reason to believe that it would receive favor. Many German manufacturers are constantly figuring on purchasing foreign machinery, but find it impossible to pay spot cash. Payments on such easy terms, as the financing corporation makes possible, would no doubt greatly foster business of this kind.

BUSINESS BAROMETER . . . . *Diminution of credit during the past week may presage a localized decline, although the outlook is cheerful in most lines except building*

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

AT INTERVALS during the past year or so, prominent bankers and Federal Reserve officials have cried "Wolf" to the stock market, and as no wolf came many enthusiastic speculators decided that the warnings could be ignored. But the Reserve Board on Wednesday last sounded another alarm and this time the wolf was here, in the guise of an advance in the Bank of England rate from 4½ to 5½ per cent, which will stop for the present the flow of funds from London to New York, and which therefore deprives the stock market bulls of one of their important supports.

The statement issued by the Reserve Board showed reluctance to call a spade by its name, but beneath its verbiage it said that the member banks have no right to borrow at the Reserve Banks for the purpose of making or maintaining loans to speculators, and that it is the duty of the Reserve Banks to take such measures as shall be deemed suitable and effective to prevent them from doing so.

Rightly or wrongly this is construed as a threat that another advance in the rediscount rate will be invoked if the warning is not heeded, and that by moral suasion and every other means in their power the Reserve Banks will check rediscounting and reduce their holdings of bills and securities in an endeavor to starve speculation, if it cannot be overcome by direct attack.

One of the facts, which have emerged from the intensive study of business that has been practised since the war, is that the economic structure of modern society is so tied up with the emotional complex of the community that the two must always be considered together. During the past two or three years emotions have been captivated by the rapid increase in the world's wealth that has been so greatly accelerated by the introduction of scientific methods and labor-saving machinery, and their chief expression has been the marking up of stock prices and the continuing increase in brokers' loans. Last week these loans advanced another $110,000,000 and, as an example of what has been going on in the market, it may be mentioned that the stock of a hundred million dollar investment corporation recently brought out has increased in value by over $120,000,000 during the past few weeks, a tremendous advance.

There are many other instances of financial alchemy that are hardly less amazing, and in the circumstances it is not surprising that the vision of the entire nation has been concentrated on the stock market. Of such a situation it is impossible to speak with any certitude, but if the large part that emotions have played in creating it is once admitted and understood, it will be realized that the picture has a reverse side also. And if a few more dashes of cold water, such as this week has brought are thrown upon the speculative fervor, the effect may be a series of declines until prices are once more based on going values instead of expectations of what they will be a couple of years hence.

Of all the possible shocks to which the market may be subjected, the most severe will be signs of an impending business recession, however moderate. To those who are scanning the horizon for such a sign the most important news of the week outside the field of finance is the decline of 4 per cent in January building contracts, as compared with a year ago, reported by the F. W. Dodge Corporation. The drop is not great, but it follows a decline of 9 per cent in December, and the amount of work contemplated at the end of January was 10 per cent less than a year previous. This is exactly what the increase in many rates during 1928 has pointed to, and if it continues much longer, maintenance of iron and steel production at the present record level will probably prove impossible and recession will spread to other industries.

Otherwise the business record is upon the whole cheerful. It is estimated that the automobile industry turned out 400,000 cars in January, which is far ahead of all previous records for the month, and there is no abatement in either its activity or its optimism. Iron and steel production is the largest in about two years, if not for all time at this season, and the strength of prices points to a continued large output. The volume of business as indicated by car loadings is greater than a year ago, and in some of the commodity markets the spirit of speculation appears to be manifesting itself in a quiet way.

The rise in staples may or may not be significant, but it is at least worth comment. The weight of precedent favors the belief that the rise in stocks must sooner or later be followed by an increase in the value of essential staples and despite the setback of the past week there are many who believe that the boom will not reach its climax until it has extended to commodities.

Nor should the forthcoming appropriation for farm relief of a revolving fund placed by Senator Smoot at $300,000,000 and a "half billion if necessary," be overlooked. It will be an inflationary influence of the first importance.

These factors tend to limit to the stock market the significance of the diminution in the supply of credit that is indicated by this week's major events, and, if the effect of the latter should be a localized decline even the corporations whose shares are affected would be the last to regret it.

IN ALL centers reporting this week, business in machine tools and machinery is found to be at a higher level than at this time a year ago. In more than one instance, January was a record month as far as volume of orders goes, and February activity is at a still higher rate. From both New York and Chicago comes the report that some of the dealers and representatives there have done in the first week of February as much business as in all of January. Only in Detroit does there seem to be an appreciable lull in buying, but this condition is felt to be only temporary in view of many rumors of plant expansions.

SEVERAL big orders for equipment for use in radio apparatus manufacturing plants are featured in the Philadelphia market, and automotive buying leads in other centers, but the characteristic of the market all over the country is sales to well scattered sources. Firms that made inquiry a year or more ago are now beginning to buy, and more recent inquiry and current orders are coming from all classes of metal-working shops. About the only bright spot in the railroad situation is to be found in the Chicago market, where some large lists are being issued by some of the leading roads. A few railroad sales are also reported in Philadelphia.

THE delivery situation is about holding its own, but while deliveries are becoming no longer, more firms are finding themselves in this condition, so that competition is being affected less than before, when the firm that could deliver first got the order. In certain sections, as New England, the labor problem is more acute.

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The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

DETROIT

Although the machinery market is not as active as it was in January and general business seems to have dropped off a little, there is a definite atmosphere of optimism here, and most dealers believe March will be a very good month.

Even though there is a slight lull, most of the equipment and machinery dealers are of the opinion that conditions are better than they were at this time last year. Orders are coming in, but they are mostly for replacement material and for small tools. The tool and die shops are working, but not as much as they have been. Thus far in February there has been a general impression of marking time.

At present there are rumors of expansions and of changes in models that should result in the placing of very large orders before many weeks have passed. If these things happen the entire first half of 1929 should be an exceedingly profitable one.

NEW ENGLAND

The machine tool and machinery industry is thoroughly satisfied with the amount of new business that has developed since the year opened. January was a very good month and early indications point to an equally good February. Automatic requirements have increased rather than diminished from all sources, and builders find themselves making no material gain on their volume of orders since Jan. 1. The skilled labor problem has become more acute. Many plants are more seriously handicapped than is supposed, and have been pushed to the limit in some cases to maintain production schedules.

Inquiries and orders alike are representative of a diversified demand. The automotive industry, however, continues to be perhaps the heaviest New England buyer, and the aeronautical and radio industries are well represented. A Providence company mnaufacturing the latter line is expecting to equip a new factory unit shortly. A Latonia (N. H.) company is planning a 4-story plant addition for the manufacture of knitting machinery. The Pratt & Whitney Aircraft Co., Hartford, is to furnish 100 or more airplane engines to go into commercial Fokker planes. This company has a valuation order balance in excess of 8 million dollars. Wareham, Mass., is to have an airport, and plans call for equipping a small machine shop.

The delivery problem is particularly acute in the large automatic field. Small lathes and drills are still available in two or three weeks, the larger lathes six and seven weeks. Small equipment in the hand and automatic line is still available in some instances from stock.

PHILADELPHIA

Substantial purchase of machinery and equipment by two of the country's outstanding radio apparatus producing plants and similar purchases by a talking machine company, marked the activities in the Philadelphia market during the last two weeks. Reports were received also that the Atwater Kent Manufacturing Co., which has recently started a large addition to its radio manufacturing plant here, will increase its output very substantially during the next eighteen months.

In addition to the sales noted above, the machinery and machine tool business in this territory has kept on a high level so far this year. There were some substantial sales to industrial lines scattered over a wide area, and there also was some replacement buying from two railroads. Manufacturers of small tools reported their volume of orders to be on a satisfactory level, with inquiries coming from a scattered area and from a variety of industrial lines. Manufacturers of gears also reported a rather brisk business with pospects of continued activity.

On the whole, the business situation in this market is regarded as good, with January sales exceeding those of the corresponding period of last year, and with prospects of continued activity.

MILWAUKEE

The flow of new business into local machine tool plants continues at a high rate, and inquiry is of a character that indicates a further continuance of buying on a large scale. For some shops, January was equilly as good a month as any yet experienced, while in practically all instances, substantial increases in volume were recorded over the month a year ago. February opened with good business, and the situation has since continued favorable in every respect.

At no time since the War has there been so wide a distribution of buying sources as during recent months, and the fact that sales are so broadly diversified and becoming more so has built up a confidence that there will be no let-up in the demand for months to come. Shops are from several weeks to three or four months behind on deliveries, despite every effort to bring production upward. The acute scarcity of skilled labor remains one of the principal factors limiting output and plans for expansion of capacity by manufacturers of equipment.

A characteristic of demand that has been the outgrowth of this situation and represents about the only important change is that users of equipment are anticipating their needs farther ahead than customary, in order to get their machines when the need is greatest. Accordingly, some orders have been booked for delivery at unusually distant dates.

The crowded condition of tool shops is reflected by the improving situation in the used tool market, although the influx of equipment is rather heavy because of the large part replacements are taking in current demand for new equipment.

CINCINNATI

Taking the machine tool industry of the Cincinnati district as a whole, the sales were at approximately the same high level as in the previous week. A few manufacturers report a slight gain and a few report a slight loss, but one offsets the other. Selling agents report that the market is improving in local and adjacent territory and state that they regard the outlook as most encouraging.

Several fairly large orders and many smaller ones are reported as having been received from automobile and accessory mnaufacturers. The greater part of the business booked, however, consisted of single orders from miscellaneous users, located in all sections of the country. Export orders are reported from several European countries, including Russia, Germany, Italy and Spain, and one came from Japan. None of the purchases were large, however.

Inquiries came in freely during the week, from all sections of the country, the requirements being mainly for single tools.

Among the comments made by manufacturers were the following: "Business was at an excellent level in the week and there were plenty of inquiries—almost too many." "Business was particularly good in the automotive field, and there was a good volume of well-scattered general business." "The week was very satisfactory, with orders coming from all sections of the country, and although the orders were small they formed a good aggregate."

CHICAGO

Business in machine tools for the first week in February shows continued gain in volume. Reports from various sources are such as to warrant the forecast that this month will reach a higher level than for several years past. A significant indication of the present trend may be drawn from a statement made by the Chicago representative of one of the largest tool building plants of the East, who said "Our business for the first week in February equalled that of the entire month of January, which carried a larger volume of trade than in any similar period for the last two years."

Railroad inquiry is now getting under way, the Atchison, Topeka & Santa Fe and the Chicago, Milwaukee, St. Paul & Pacific having issued fairly sizable preliminary lists of shop equipment requirements. The Illinois Central, whose purchases of machine tools last year was negligible, is also expected to come into the market within a few weeks for tools needed in its shops.

General demand at this time is in large degree from industrialists in the Chicago area. The call for used tools has shown a slight falling off within the last few days, but still is of fair volume. Numerous inquiries for heavy-duty equipment of this character are being received by dealers.

CLEVELAND

Activity of the machine tool business which started in the latter part of 1928 in the local market has continued steadily through January and shows no prospect of slackening this month, according to leaders in the industry. Activity in the automobile industry has been the chief support of the local progress and if the general feeling of optimism is correct, we may look forward to even greater activities during the next six months.

The month of January of this year shows considerable increase over January, 1928. Dealers claim their business is more than favorable. Sellers of automatics report the best month for several years. According to the president of one company the outlook is about 100 per cent better. Business, in fact, has been reported so good at some concerns that its officials cannot take their customary winter vacations in the South.

NEW YORK

Sales of machine tools continue at a high rate in the New York market. After a record year, January turned out to be an excellent month, the best in the history of several leading dealers, and the prospects are that February will be an even better one on the average. One dealer and one factory representative made the statement that the volume of business placed in the

first eight days of February already exceeded that placed in the entire previous month, which, while it had not reached the record proportions indicated above for these particular two, was by no means a poor one. Wide diversification of buying continues to be featured. Orders are being received from all kinds of metal-working shops, some of which made inquiry for tools over a year ago.

The high light of the past week's business was the purchase of a sizeable amount of equipment by the Elevator Supply Co., of Hoboken. Included in the machines bought were: five lathes, two milling machines, a radial drill, an upright drill, and some turret lathes. The largest outstanding prospect is the Lycoming Manufacturing Co., of Williamsport, Pa. The program of buying of equipment by this firm for building a radial, air-cooled aircraft engine is comparable with that of the Wright Aeronautical Corporation in the past year. General inquiry, however, indicates that much well scattered business will be placed in the next few months.

Sales made by the Triplex Machine Tool Co. in the past week included; two Springfield lathes, one radial drill, one upright drill, one Garvin tapper, two Ames bench lathes, two Williams cutting-off machines, one Reid surface grinder, two bench drill presses, and two Edlund 4-spindle upright drills.

BUFFALO

With some rare exceptions the machine tool business in this district during January was as good as that of any month last year. One dealer went so far as to state that it was the best month he ever had. But that report was exceptional.

Electrical houses specializing in industrial equipment reported that January also was exceptionally good, the most favorable report in six months. One house sold considerable equipment for stone crushing purposes. In both fields there is every reason to believe that February will be practically as good as January. Generally speaking inquiries are good and business is being closed. Business is quiet among those handling contractors' equipment, as has been the case for some time.

Aeronautical Notes

The Davis Aircraft Corporation, of Richmond, Ind., has acquired all machinery and tools of the Vulcan Aircraft Co., of Portsmouth, Ohio, and will build a new plane to be known as the D A C. The machine will be powered with a LeBlond engine and will be made entirely of metal, except for the wing covering. The plant of the Richmond Piston Ring Co. has been taken over to manufacture the planes. The Davis firm is capitalized at $150,000 and is headed by Walter C. Davis, formerly of the George W. Davis Motor Car Co., as president and general manager.

The Berliner-Joyce Aircraft Corporation has been incorporated in Maryland with an authorized capital stock of $1,000,000 and will erect a plant adjacent to the city's proposed airport. The plant with equipment will cost about $250,000. It will contain about 50,000 sq.ft. of floor space. The plant will be used for the manufacture of a three-passenger monoplane for commercial purposes and a small all-metal monoplane to sell at low cost. The company has established temporary headquarters with Townsend Scott & Son, 209 East Fayette St., Baltimore.

Changes in the operating personnel of the Brownback Motor Laboratories, Inc., Graybar Building, N. Y., maker of the Brownback radial engine have been announced. C. H. Phelps is president; H. L. Brownback, vice-president; A. W. Rinke, secretary-treasurer; Theodore C. Phelps, general manager and Abbott A. Lane, assistant general manager in charge of production. The company's first production of 600 units of the C400 engine, a 6-cylinder double-row radial, has started at the Pottstown (Pa.) plant. Production of the CS200 3-cylinder engine will follow.

Business Items

The York Heating and Ventilating Co., of Philadelphia, maker of unit heaters, has made a number of changes in its selling organization. B. E. Thurness has been transferred from Dayton to the Cleveland office, 948 Hanna Bldg., where he is manager, succeeding H. V. Heard. The Dayton office has been removed to Cincinnati, with J. E. True, formerly of New York, in charge. G. W. F. Myers, formerly of the Philadelphia office, is now manager at St. Louis, where a new office has been opened at 1514 Chemical Bldg. M. K. Clarke, also from the Philadelphia office, has been made manager of the new Louisville (Ky.) office.

The Schauer Machine Co., a newly formed corporation of $100,000 of Cincinnati, has purchased the assets of the Neil & Smith Electric Tool Co., an Ohio corporation formed 20 years ago. L. Lee Schauer, son of the late Sherman C. Schauer, one of the pioneers of the machine tool industry, is president of the new company. For the past two years, Mr. Schauer has been connected with the Lodge & Shipley Machine Tool Co., and for the previous 18 years he was with the Cincinnati Bickford Tool Company.

It has been officially announced that the firm of J. Coughlan and Son, Ltd., pioneers in the structural steel business at Vancouver, B. C., have sold their structural steel and shipbuilding plant on False Creek to Eastern interests, represented by Frank M. Ross of Montreal, vice-president of Canadian Vickers, Ltd., and W. B. Champ, of Hamilton, Ont., vice-president and managing director of the Hamilton Bridge Co., Ltd. It is understood that steps will be taken immediately to erect a modern structural steel plant on the Coughlan property.

The Apex Machine Co., Dayton, Ohio, has appointed the Thomson Tool & Supply Co., Odd Fellows Bldg., Indianapolis, representative in Indiana, and the Camm-Blades Machinery Co., 610 Michigan St., Milwaukee, representative in Wisconsin. The Apex company has opened its own office in Detroit, in the General Motors Bldg., under the supervision of David O. Goudie.

W. I. Martin & Co., 192 North Clark St., Chicago, Ill., has been appointed exclusive national distributors for the line of safety guards, air ejectors, and unit air compressors used on punch presses, made by the Benjamin Electric Manufacturing Co., also of Chicago. This arrangement does not affect the other Benjamin lines, which are electric lighting, wiring, and signaling products and which will be sold through the same channels as at present.

The Fafnir Bearing Co., New Britain, Conn., held its annual meeting February 6 and re-elected officers and directors. The company during 1928 increased its surplus from $468,196 to $632,683 as of December 31, 1928. During the year $600,000 was paid out in the form of dividends, the only figure on earnings available. Assets of the company are $3,827,341.

The Pines Winterfront Co. is erecting a new $3,000,000 plant at Cicero and Division St., Chicago, Ill. The ground floor will be given over to production machinery and the tool department, while executive offices, finishing rooms and laboratories will be on the second. A large chromium-plating department is to be featured.

Cutler-Hammer, Inc., Milwaukee, Wis., announce that they have acquired the business of the Trumble Vanderpool Electric Manufacturing Co., of Bantam, Conn., and will operate it as a subsidiary under its present name. This purchase will add a complete line of meter service and safety switches to the present Cutler-Hammer line.

The Estwing Manufacturing Co., Rockford, Ill., has increased its capital stock from $25,000 to $100,000 to provide for the development of its patented "Unbreakable" line of hammers, hatchets, and camp knives. E. L. Estwing is vice-president and general manager of the company.

The Brown Instrument Co., of Philadelphia, has removed its Buffalo office from 624 Ellicott Sq. to 402 Maritime Trust Bldg. The company also announces that O. B. Wilson has been placed in charge of the Cleveland office at 819 Hippodrome Building.

Directors of the Clifford-Jacobs Forging Co., Champaign, Ill., have approved plans to enlarge the plant to provide for increased production. During the past year 165 men were employed and night shifts were used to keep up with production schedules. D. B. Jacobs is president and general manager.

The T. J. Holmes Co., Boston, Mass., has acquired the plant at Norton, Mass., formerly occupied by the Freeman Daughaday Co., and will move its equipment from the Boston plant. The company manufactures atomizers and employs 200 when on full schedule.

The Rheinberg-Jacobson Manufacturing Co., Rockford, Ill., has been incorporated to manufacture, buy, sell and deal in all kinds of machinery. Capital, $30,000 common. Incorporators: Axel Rheinberg, Gust A. Jacobson and Levin Faust.

The Rockford Plastic Manufacturing Co., Rockford, Ill., has been incorporated to deal in plastic compounds, dies, and tools. Capitalization is $100,000 preferred stock and $250,000 common. The incorporators are D. S. Beebee, H. F. Kors, George Maloney, and Ruby Tangman.

The new eastern office of the Foote Bros. Gear & Machine Co. is located in the Transportation Bldg., 225 Broadway, New York, N. Y., instead of in the Woolworth Bldg., as previously announced.

The DeWalt Products Corporation, Leola, Lancaster County, Pa., is successor to the DeWalt Products Co., of the same address, manufacturer of woodworking specialties.

The Commercial Tool Co., Cleveland, is now agents for the line of Coulter automatics made by the Automatic Machine Co., of Bridgeport, Conn.

Personals

C. W. YERGER, formerly Eastern district manager of Cutler-Hammer, Inc., on March 4 will assume the duties of sales manager of the Hanson-Van Winkle-Munning Co., of Matawan, N. J., E. N. Boice, secretary of the Munning Company, who, in addition to his other activities, has been directing the sales of the company, will now give his full time to regular executive duties. Mr. Yerger has been associated with the Cutler-Hammer firm since 1908. Prior to his last position he was successively engineer, Pacific Coast representative, manager of the Cincinnati, Washington, and Boston offices. He also spent some time in England in the company's behalf.

CLIFTON A. CROCKER has been elected president of the National Equipment Co., Springfield, Mass., to fill the vacancy caused by the death of Frank H. Page. Mr. Crocker had been a vice-president and director of the company for many years. John J. Duggan, treasurer of the Chapman Valve Manufacturing Co., was chosen director in Mr. Page's place. George A. Bausman, treasurer of National Equipment, has also been given the office of vice-president. Albert L. Bausman was re-elected vice-president.

E. P. BURRELL, director of Engineering, of the Warner & Swasey Co. Cleveland, is leaving for California to take charge of designing the new 200-in. telescope to be built for the California Institute of Technology. Mr. Burrell has been chiefly engaged in the technical problems of machine tool design, but in the scientific world he is known as the designer of large telescopes. He will lay out the machinery which will keep the telescope trained on a single star.

HARRY S. KARTSHER has joined the organization of the Commercial Tool Co., Cleveland. He has had wide machine tool experience. He was machinery designer with the Niles-Bement-Pond Co., gage engineer in the Ordnance Department during the War, mechanical engineer with the Cleveland Twist Drill Co., standards engineer with the White Motor Co., and industrial and designing engineer with the Trundle Engineering Company.

ROBERT B. BLACK, advertising manager of the Black & Decker Manufacturing Co., Towson, Md., sailed for Europe on February 9, aboard the S. S. Majestic. Mr. Black's itinerary will include England, Scotland, France, Czecho-Slovakia, Austria, Switzerland, Belgium, and Holland. He will be in Leipzig, Germany, during the Leipzig Trade Fair, where Black & Decker will have an exhibit.

E. M. MAY has been placed in charge of the New York district office of S. F. Bowser & Co., Inc., 67 West 44th St., lubricating specialists. The territory covered comprises greater New York, Connecticut and twelve counties in New Jersey. Mr. May will direct all activities involving the sale of equipment to industrial plants.

GEORGE M. HOLLEY, president of the Holley Carburetor Co., Detroit, and of the Towle Marine Airplane Co., also of Detroit, has acquired a substantial interest in the Kinner Airplane & Motor Corporation, of Glendale, Calif., and has been elected a director. He is also a director of the Stinson Aircraft Co., of Detroit.

E. S. FICKES, vice-president in charge of engineering of the Aluminum Co. of America, Pittsburgh, has been elected a director of the company. W. C. NEILSON, in charge of the bauxite interests of the Aluminum Company, was also elected a vice president.

JULES DIERCKX, of Brooklyn, N. Y., and Antwerp, Belgium, and connected with the Keller Mechanical Engineering Corporation, of Brooklyn, is sailing for Europe on February 16. One of the objects of his trip is to visit the Leipzig Trade Fair to be held in March.

JOHN C. SPENCE, formerly works manager of the machine division of the Norton Co., Worcester, has bought an interest in the Universal Boring Machine Co., Hudson, Mass., and has become works manager of that company.

R. F. CREGO, formerly sales manager of the L. C. Smith Bearing Co., of Chicago, has joined the sales organization of the Foote Bros. Gear & Machine Co., also of Chicago, and will handle sales in the Loop district of the city.

E. J. BETTENDORF, secretary and treasurer of the Bettendorf Co., Bettendorf, Iowa, has been elected vice-president of the Bettendorf Savings Bank.

E. R. LEEDER is now factory manager of the Fisher Body Corporation, Lansing, Mich., in place of C. C. Gross, resigned.

EDWARD P. WELLES, president of Chas. H. Besley & Co., Chicago, sailed for Europe on Feb. 7.

Obituaries

FREDERICK W. MOLSON, director of the Dominion Bridge and Engineering Co., the Northern Electric Co., and a number of other leading industrial concerns in eastern Canada, died suddenly at his home in Montreal on Feb. 5. Mr. Molson, who was a member of one of the oldest Canadian families, was in his 69th year.

HARVEY A. CALL, of the research department of the Copper & Brass Research Association, died on Feb. 8 after an attack of influenza. He was well known in the plumbing and heating trades, having been for many years editor of *Sanitary and Heating Engineering*.

JOSEPH HOLTON DEFREES, 71, chairman of the board of the Chamber of Commerce of the United States and prominent lawyer and business man, died on Feb. 5 at Washington, D. C.

EDWIN J. MORRIS, president of Morris & Co. and the Hussong Dyeing Machine Co., Groveville, N. J., died on Jan. 30 at his home near Princeton.

Forthcoming Meetings

AMERICAN MANAGEMENT ASSOCIATION. Production Executives' conference, Feb. 27-28 and Mar. 1, at the William Penn Hotel, Pittsburgh, Pa. Oscar Grothe, vice-president in charge of the production executives' division, c/o White Sewing Machine Co., Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Regional meeting in Knoxville, Tenn., March 21-22. Eastern spring meeting in Rochester, N. Y., week of May 13. Third national meeting of the aeronautic division, St. Louis, Mo., May 27-30. Semi-annual meeting, Salt Lake City, Utah, July 1-4. Calvin W. Rice, secretary, 29 West 39th St., New York City.

NATIONAL METAL TRADES ASSOCIATION. Convention, Hotel Drake, Chicago, April 24-25. J. E. Nyhan, national secretary, Peoples Gas Building, Chicago, Ill.

AMERICAN WELDING SOCIETY. Annual meeting, April 24-26, at the Engineering Societies Bldg., New York. M. M. Kelly, secretary, 29 West 39th St., New York.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION. Thirteenth annual meeting to be held in the Hotel Statler, Cleveland, Ohio, May 16-18. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, June 24-28, at the Chalfonte-Haddon Hall, Atlantic City, N. J. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

The Weekly Price Guide

Rise and Fall of the Market

RAW materials such as pig iron and scrap, used in steel making, continue firm with upward tendencies. Finished steel demand is keen at present in automotive and railway material. Prices, however, declined this week at New York warehouses, on the following items: sheets, black and galvanized, 20c. per 100 lb.; rivets, 50c. per 100 lb.; increased discounts, equivalent to declines, on machine bolts, lag screws, washers and nuts. Cold drawn steel, on the other hand, advanced 10c. per 100 lb. In non-ferrous metals, copper rose ¼c. and lead, ⅛c. per lb., while tin declined ½c. per lb., in New York warehouses. Copper mine and smelter workers received, this week, a 5 per cent advance in wages.

(All prices as of Feb. 8, 1929)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 1.75@2.25)	25.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	16.50@17.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	22.26
PITTSBURGH, including freight charge ($1.75) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10	3.35	3.25	3.90*
No. 12	2.15	3.40	3.30	3.95*
No. 14	2.25	3.45	3.35	4.00*
No. 16	2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.65	3.60	3.40	3.80
No. 22	2.80	3.75	3.55	3.95
No. 24	2.85	3.80	3.60	4.00
No. 26	2.95	3.90	3.70	4.10
No. 28	3.10	4.50	3.85	4.25
Galvanized				
No. 10	2.80	3.95	3.75	4.05
Nos. 12 to 14	2.90	4.05	3.85	4.15
No. 16	3.00	4.15	3.95	4.25
No. 18	3.15	4.30	4.10	4.40
No. 20	3.30	4.45	4.30	4.55
No. 22	3.35	4.50	4.35	4.60
No. 24	3.60	4.65	4.45	4.75
No. 16	3.75	4.90	4.70	5.00
No. 28	4.00	5.15	4.95	5.25

*Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

—Thickness— Decimal Fractions	B.w.g. and	Outside Diameter in Inches ⅛	¼	⅜	½	⅝	¾	⅞
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.50	3.65	3.60
Cold drawn, flat or square‡	4.00	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16@½-in. thick. †250 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			17.75
Tin, Straits, pigs, New York			51.50
Lead, pigs, E. St. Louis	6.62½	New York	8.00
Zinc, slabs, E. St. Louis	6.35	New York	8.00

	New York	Cleveland	Chicago
Antimony, slabs	13.00	12.62½	14.25
Copper sheets, base	26.12½	26.12½	26.12½
Copper wire, base	22.37½	22.37½	18.87½*
Copper bars, base	24.62½	24.62½	25.12½
Copper tubing, base	27.37½	27.37½	27.37½
Brass sheets, high, base	21.50	21.50	21.50
Brass tubing, high, base	26.37½	26.37½	26.37½
Brass rods, high, base	19.25	19.25	19.25
Brass wire, high, base	22.00	22.00	22.00

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	24.30	24.30
Zinc sheets (casks).....	10.00@10.50	11.00	10.11
Solder (½ and ½).....	34.50	34.00	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			67.00
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.25

*Delivered.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold rolled.....	53.00	40.00†
Tubing.....	75.00*	90.00
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Cold drawn.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	15.00 @15.25	14.25	13.75 @14.25
Copper, heavy, and wire..	14.00 @15.00	13.75	13.12½@13.50
Copper, light, and bottoms	12.75 @13.25	11.50	12.00 @12.50
Heavy lead.....	5.25 @ 5.50	6.25	4.75 @ 5.25
Tea lead.....	3.62½@ 4.12½	4.25	3.75 @ 4.25
Brass, heavy, yellow.....	8.25 @ 8.75	9.00	8.75 @ 9.25
Brass, heavy, red.....	11.00 @11.75	11.75	11.50 @12.00
Brass, light.....	7.00 @ 7.50	7.25	7.75 @ 8.25
No. 1 yellow rod turnings.	9.50 @10.00	9.50	9.50 @10.00
Zinc.....	3.25 @ 3.75	3.25	3.00 @ 3.50

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.†.....	.16@.16½	38.00 per M	.16
Sal soda, per lb.....	.02	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.108	.11	.11
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.	.30	.36	35
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30– 5%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*All waste in bale lots. †100-lb. bales or less.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.0325	$0.0324
Cold drawn shafting...	per lb..	.035	.034	.033
Brass rods.....	per lb..	.1925	.1875	.165
Solder (½ and ½).....	per lb..	.345	.3475	.35
Cotton waste, white...	per lb..	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	3.59	3.59	3.10
Lard cutting oil.....	per gal.	.65	.65	.65
Machine oil.....	per gal.	.30	.30	.27
Belting, leather, medium.....	off list..	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper.....	$4.05	$4.29	$4.29
Emery cloth.....	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper.....	2.04	2.04	2.04
Cloth.....	3.59	3.59	3.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.75@2.85
Coke, prompt foundry, per net ton...	Connellsville,		3.75@4.50
White lead, dry or in oil...	100 lb. kegs....	New York,	13.25
Red lead, dry.....	100 lb. kegs....	New York,	13.25
Red lead, in oil.....	100 lb. kegs....	New York,	14.75

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7–16-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

Machine Requirements and Industrial Construction

Equipment Wanted

Ind., Bluffton—National Chest Co.—machinery and equipment for the manufacture of cedar chests, furniture and radio cabinets for recently acquired plant.

Mich., Detroit—Ex-Cell-O Tool & Mfg. Co., 1200 Cakman Blvd.—miscellaneous machinery and equipment for proposed 1 story machine shop. Estimated cost $50,000.

Mich., Detroit—LaSalle Tool & Gauge Co., Inc., Rivard & Maple Sts.—machine shop equipment including lathe.

Mich., Detroit — Warner Aircraft Corp., 4042 West Jefferson Ave.—machinery and equipment for the manufacture of airplanes for proposed 1 and 2 story factory at 8 Mile Rd. and Town Line Rd. Estimated cost $500,000.

Mo., St. Louis—C. Kahr, 1062 Garth Ave. —rip saw and motor to be run by light socket power.

N. J., Camden—Rundle Mfg. Co., 27th St. and Cleveland Ave., Milwaukee, Wis. (enameled iron ware, etc.)—electric bridge cranes and conveying equipment, etc., for proposed 150 x 330 ft. foundry, and 100 x 180 ft. enameling building. Estimated cost $1,000,000.

Ont., Georgetown—Smith & Stone Electrical Mfg. Co.—machinery and equipment for the manufacture of electrical specialties for proposed 2 story addition to factory. Estimated cost $50,000.

Opportunities for Future Business

Calif., Long Beach — Pacific Electric Railway Co., Pacific Electric Bldg., Los Angeles, is having plans prepared for the construction of 1 story, 50 x 60 ft. garage, and 75 x 200 ft. car barn and repair shop on Morgan Ave., here. Private plans.

Calif., San Francisco—Simons Bed Co., 295 Bay St., manufacturers of steel beds, awarded contract for the second unit of factory, 3 story, at North Point and Stockton Sts. Estimated cost $45,000.

Calif., Santa Monica — L. B. Norman, 1323 Georgia Ave., plans the construction of a factory on Clover Field. Estimated cost $50,000. Douglas Aircraft Co., lessee.

Ill., Chicago—Pines Winterfront Co., 408 North Sacramento Ave., manufacturers of automobile shutters, awarded contract for the construction of a 2 story factory at North Cicero Ave. and Division St. Estimated cost $1,000,000.

Ill., Chicago—Star Service Hanger Co., 2911 South La Salle St., manufacturers of wire coat hangers, awarded contract for the construction of a plant at 6601 South Oak Park Ave.

Ind., Ft. Wayne—Steinite Radio Co. is having plans prepared for the construction of a factory at Bueter Rd. and New Haven Ave. Estimated cost $400,000. Private plans.

Ind., Muncie—Muncie Products, Division of General Motors Co., is receiving bids for a 2 story, 110 x 400 ft. factory on West 8th St. Estimated cost $60,000.

Md., Baltimore—Berliner-Joyce Aircraft Co., T. Joyce, V. Pres., Joyce Station, is having plans prepared for the construction of a 1 story aeroplane factory at Municipal airport here. Estimated cost $250,000. Private plans.

Mass., New Bedford — F. Malou, 197 Blackmot St., plans the construction of a factory for the manufacture of dining cars. Architect not selected.

Mass., Newton Highlands (Boston P. O.) —L. A. Boudrot, 41 Dalby St., Newton, will build a 1 story garage and repair shop at 112 Needham St., here. Estimated cost $40,000. Private plans.

Mass., Pittsfield — R. Sarro, c/o J. Winchell, 144 Wahconah St., Archt., is having plans prepared for the construction of a 2 story, 60 x 120 ft. repair and service garage. Estimated cost $45,000.

Mass., Worcester — D. F. Deley, 1053 Main St., awarded contract for a 1 story, 100 x 135 ft. repair and service garage on Madison St. Estimated cost $60,000.

Mich., Detroit—Cadillac Motor Car Co., 2860 Clark Ave., awarded contract for a 4 story, 56 x 275 ft. engineering buildings on Clark Ave. Estimated cost $180,000.

Mich., Detroit — Fruehoff Trailer Co., 10940 Harper Ave., awarded contract for a 1 story, 155 x 160 ft. trailer factory.

Mich., Muskegon—Marine Wire Works, Western Ave., awarded contract for a 2 story, 60 x 85 ft. plant. Estimated cost $40,000.

N. J., Camden — C. Kahn, 17th and Chestnut Sts., will soon award contract for a 2 story, 55 x 131 ft. sales and service station at Bridge Blvd. and Federal St. E. A. Hopper, 10 South 18th St., Archt.

N. J., Jersey City — Burstyn & Heftler Corp., 484 38th St., Union City, will soon award contract for an 8 story garage at Academy St. and Bergen Ave. Estimated cost $1,000,000. C. Shilowitz, 26 Journal Sq., Archt. Noted Nov. 1.

N. J., Kearny—Zenitherm Co., 390 Frelinghuysen Ave., Newark, awarded contract for a 1 and 3 story, 82 x 422 ft. insulation factory on Harrison Ave. Estimated cost $250,000.

N. J., Newark—Atlas Fence Co., Inc., 37 Verona Ave., will build a 1 story factory for the manufacture of wire fence at 35-49 Verona Ave. Estimated cost $40,000. A. H. McCully, 61 Schley St., Archt. Noted Feb. 7.

N. J., Newark — Sacks Barlow Co. awarded contract for a 1 story addition to foundry on Rome St. Estimated cost $40,000.

N. J., Westwood—Nash Westwood Co., Inc., 311 Broadway, will build a 2 story, 85 x 150 ft. garage at Jefferson Ave. and Center St. Estimated cost $150,000. B. F. McGuire, 416 Cedar Lane, Teaneck, Archt.

N. Y., Brooklyn — Eberbuilt Corp., L. Feinstein, Pres., 152 Wyona St., will build a 2 story, 60 x 99 ft. garage at Vermont and Liberty Sts. Estimated cost $40,000. Cohn Bros., 363 Stone Ave., Archts. Noted Jan. 31.

N. Y., Brooklyn—M. S. Homes Corp., J. Mintz, Pres., 8769 23rd Ave., will build a 3 story, 25 x 89 ft. garage, etc. on Clara and Chester Ave. Estimated cost $65,000. S. Gardstein, 44 Court St., Archt. Noted Jan. 31.

N. Y., Long Island — Famous Players Lasky Corp., 1501 Broadway, is receiving bids for the construction of a machine shop, carpenter shop, etc., at 35th St. and 35th Ave. Estimated cost $110,000. C. C. Hamilton, 1501 Broadway, Archt.

N. Y., New York—H. L. Broome, Inc., W. C. Jackson, Pres., 54 East 56th St., plans the construction of a 6 story, 100 x 154 ft. garage at 152 East 87th St. Estimated cost $75,000. M. J. Ort, 424 East 149th St., Archt.

N. Y., Neew York — Muir McDermott Corp., 320 Southern Blvd., plans the construction of a 100 x 200 ft. garage at Tiffany St. and Oak Point. Estimated cost $40,000. G. A. Bagge & Son, 157 East 44th St., Archts.

N. Y., New York — Twenty-Three West 65th St. Corp., W. Liberman, Pres., 113 West 42nd St., plans the construction of a 6 story, 75 x 100 ft. garage at 42 West 66th St. Estimated cost $75,000. M. J. Ort, 424 East 149th St., Archt.

N. Y., Woodlawn — Presco & Sorerio, 9073 Sutlin Blvd., Brooklyn, plans a 1 story, 100 x 100 ft. garage at Ferry St. and Atlantic Ave., here, also 1 story, 49 x 278 ft. garage at Northern Blvd. and 160th St., Long Island City. Estimated cost $40,000 and $100,000 respectively. W. Winters, 2772 Fulton St., Brooklyn, Archt.

N. Y., Woodside—E. Ruth, Jr., 129 Oxford Blvd., Garden City, is receiving bids for the construction of a garage at Roosevelt Ave. and 60th St. Estimated cost $85,000. C. L. Varrone, 166 Corona Ave., Archt.

O., Canton—Timken Roller Bearing Co., Dueber Ave., awarded contract for the construction of first unit of tube mill, 1 story, 320 x 450 ft. Estimated cost $200,000. Noted Jan. 31.

O., Cleveland — Cleveland, Cincinnati, Chicago & St. Louis Ry. Co., 230 East 9th St., Cincinnati, is having preliminary plans prepared for addition to roundhouse, service building, etc., at Lenndale yards here. Estimated cost $600,000. H. Baldwin, Ch. Engr.

O., Cleveland—Winton Engine Co., 2116 West 106th St., awarded contract for a 1 story, 35 x 185 ft. pattern shop at 2116 West 106th St. Estimated cost $40,000. Noted Feb. 7.

O., East Cleveland (br. Cleveland)—Bd. of Education, C. B. Tilden, Dir., Euclid and Shaw Aves., will receive bids until Feb. 25 for a 2 story, 60 x 100 ft. shop, etc., on Elderwood Ave. Estimated cost $45,000. H. M. Morse Co., Finance Bldg., Cleveland, Archt.

Pa., Philadelphia — International Harvester Co. of America, T. Henderson, 2905 North 16th St., awarded contract for a 1 story, 110 x 225 ft. service station at Erie and F Sts. Noted Jan. 31.

Pa., Pittsburgh — East Liberty Garage Co., 6014 Penn Ave., is having plans prepared for a 6 story, 100 x 144 ft. garage on Broad St. Estimtaed cost $400,000. N. F. Arble, 620 2nd Ave., Archt.

Tenn., Memphis—Boynton & Co., G. J. Murch, V. Pres. and Secy., has acquired the warehouse of James & Graham Wagon Co., and plans to remodel for woodworking plant. Estimated cost $200,000.

Wis., Milwaukee—Argonaut Realty Corp., General Motors Bldg., will soon receive bids for a 1 story, 126 x 145 ft. garage. R. H. Smith, 208 3rd St., Archt.

Ont., Hamilton—Canadian Westinghouse Co. Ltd., Sanford Ave., awarded general contract for the construction of a 1 story, 87 x 290 ft. transformer station and assembly building on Myler St. Estimated cost $200,000.

Ont., St. Catharines — McKinnon Industries, manufacturers of automobile specialties, plans addition to factory. Estimated cost $1,000,000.

Ont., St. Thomas — St. Thomas Metal Signs, Talbot St., is having plans prepared for a 2 or 3 story addition to factory. Estimated cost $50,000. J. T. Findlay, 430 Talbot St., Archt.

Ont., Toronto—Canada Metal Co. Ltd., 39 Fraser Ave., is having plans prepared for a 1 story, 100 x 270 ft. addition to factory. Estimated cost $100,000. F. S. Mallory, 11 Roseberry Ave., Archt. Noted Dec. 20.

Ont., Toronto—Day Name Plates Ltd., 4 Woodfield Rd., plans the construction of a 2 or 3 story sign factory. Estimated cost $50,000. Chapman & Oxley, Sterling Tower Bldg., Archts.

Ont., Toronto — Lee & Duggan Motors Ltd., 621 Yonge St., is having plans prepared for a 3 story, 65 x 100 ft. garage at St. Nicholas St. and Irwin Ave. Estimated cost $200,000. Mathere & Holdenby, 96 Bloor St. W., Archts. Noted Aug. 23.

Ont., Toronto—Queen City Dental Manufacturers, 112½ Carlton St., is having plans prepared for the construction of a 2 story factory, etc., on Hayden St. Estimated cost $50,000. R. Card, 142 Chester